

THE  
**HORSE**  
THE  
**WHEEL**  
AND  
**LANGUAGE**



HOW  
**BRONZE-AGE RIDERS**  
FROM THE  
**EURASIAN STEPPE**  
SHAPED THE  
**MODERN WORLD**

**DAVID W. ANTHONY**

*Princeton University Press  
Princeton and Oxford*

## CHAPTER THIRTEEN



### Wagon Dwellers of the Steppe *The Speakers of Proto-Indo-European*

The sight of wagons creaking and swaying across the grasslands amid herds of wooly sheep changed from a weirdly fascinating vision to a normal part of steppe life between about 3300 and 3100 BCE. At about the same time the climate in the steppes became significantly drier and generally cooler than it had been during the Eneolithic. The shift to drier conditions is dated between 3500 and 3000 BCE in pollen cores in the lower Don, the middle Volga, and across the northern Kazakh steppes (table 13.1). As the steppes dried and expanded, people tried to keep their animal herds fed by moving them more frequently. They discovered that with a wagon you could keep moving indefinitely. Wagons and horseback riding made possible a new, more mobile form of pastoralism. With a wagon full of tents and supplies, herders could take their herds out of the river valleys and live for weeks or months out in the open steppes between the major rivers—the great majority of the Eurasian steppes. Land that had been open and wild became pasture that belonged to someone. Soon these more mobile herding clans realized that bigger pastures and a mobile home base permitted them to keep bigger herds. Amid the ensuing disputes over borders, pastures, and seasonal movements, new rules were needed to define what counted as an acceptable move—people began to manage local migratory behavior. Those who did not participate in these agreements or recognize the new rules became cultural Others, stimulating an awareness of a distinctive Yamnaya identity. That awareness probably elevated a few key behaviors into social signals. Those behaviors crystallized into a fairly stable set of variants in the steppes around the lower Don and Volga rivers. A set of dialects went with them, the speech patterns of late Proto-Indo-European. This is the sequence of changes that I believe created the new way of life expressed archaeologically in the Yamnaya horizon, dated about 3300–2500 BCE (figure 13.1). The spread

TABLE 13.1

Vegetation shifts in steppe pollen cores from the Don to the Irtysh

Site	Razdorskoe, <i>Lower Don</i> (Kremenetski 1997)	Buzuluk Forest Pobochnoye peat bog <i>Middle Volga</i> (Kremenetski et al. 1999)	Northern Kazakhstan Upper Tobol to <i>Upper Irtysh</i> (Kremenetski et al. 1997)
Type	Stratified settlement Pollen core	forest peat bog core	two lake cores and two peat bog cores
Dates	<i>6500–3800 BCE</i>	<i>6000–3800 BCE</i>	<i>6500–3800 BCE</i>
Flora	Birch-pine forest on sandy river terraces. On floodplain, elm and linden forest with hazelnut & black alder. Oak and hornbeam present after 4300 BCE.	Oak trees appear, join elm, hazel, black alder forests around Pobochnoye lake. 4800–3800 BCE lake gets shallower, <i>Typha</i> reeds increase, forest expands.	Birch-pine forest evolving to open pine forest in forest-steppe, with willow near waterways. In steppe, <i>Artemesia</i> and <i>Chenopodia</i> .
	<i>3800–3300 BCE</i> Slight reduction in deciduous trees, increase in <i>Ephedra</i> , hazel, lime, and pine on floodplain.	<i>3800–3300 BCE</i> Lake slowly converts to sedge-moss swamp. <i>Typha</i> reeds peak. Pine and lime trees peak. Probably warmer.	<i>3800–3300 BCE</i> Moist period, forests expand. Lime trees with oak, elm, and black alder also expand. Soils show increased moisture.
	<i>Sub-Boreal 3300–2000 BCE</i> Very dry. Sharp forest decline. <i>Cerelia</i> appears. <i>Chenopodia</i> sharp rise. Maximum aridity 2800–2000 BCE.	<i>3300–2000 BCE</i> Reduction in overall forest. In forest, pine down, birch up. <i>Artemesia</i> , an arid herb indicator, increases sharply. Lake is covered by alder shrubs by 2000 BCE.	<i>3300–2000 BCE</i> Forest retreats, broadleaf declines. Mokhove bog on the Tobol dries up about 2800 BCE. Steppe grows.

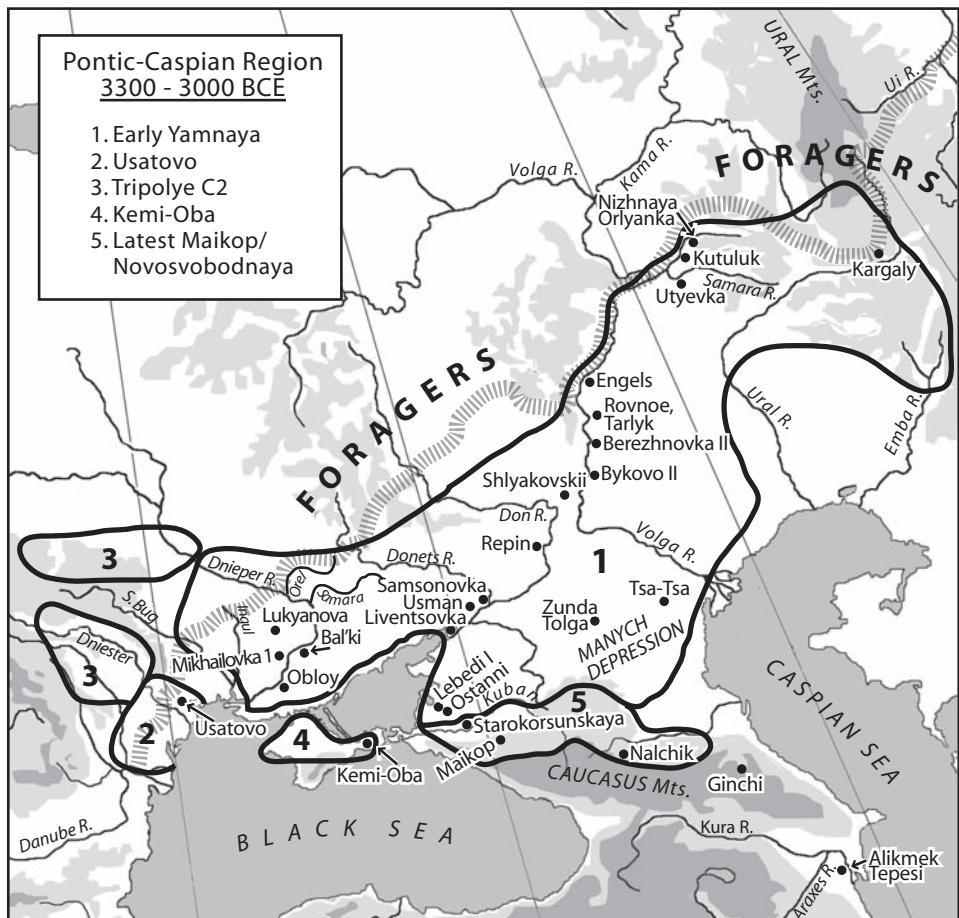


Figure 13.1 Culture areas in the Pontic-Caspian region about 3300–3000 BCE.

of the Yamnaya horizon was the material expression of the spread of late Proto-Indo-European across the Pontic-Caspian steppes.<sup>1</sup>

The behavior that really set the Yamnaya people apart was living on wheels. Their new economy took advantage of two kinds of mobility: wagons for slow bulk transport (water, shelter, and food) and horseback riding for rapid light transport (scouting for pastures, herding, trading and raiding expeditions). Together they greatly increased the potential scale of herding economies. Herders operating out of a wagon could stay with their herds out in the deep steppes, protected by mobile homes that carried

tents, water, and food. A diet of meat, milk, yogurt, cheese, and soups made of wild *Chenopodium* seeds and wild greens can be deduced, with a little imagination, from the archaeological evidence. The reconstructed Proto-Indo-European vocabulary tells us that honey and honey-based mead also were consumed, probably on special occasions. Larger herds meant greater disparities in herd wealth, which is reflected in disparities in the wealth of Yamanaya graves. Mobile wagon camps are almost impossible to find archaeologically, so settlements became archaeologically invisible where the new economy took hold.

The Yamnaya horizon is the visible archaeological expression of a social adjustment to high mobility—the invention of the political infrastructure to manage larger herds from mobile homes based in the steppes. A linguistic echo of the same event might be preserved in the similarity between English *guest* and *host*. They are cognates, derived from one Proto-Indo-European root (*\*ghos-ti-*). (A “ghost” in English was originally a visitor or guest.) The two social roles opposed in English *guest* and *host* were originally two reciprocal aspects of the same relationship. The late Proto-Indo-European guest-host relationship required that “hospitality” (from the same root through Latin *hospes* ‘foreigner, guest’) and “friendship” (*\*keiwos-*) should be extended by hosts to guests (both *\*ghos-ti-*), in the knowledge that the receiver and giver of “hospitality” could later reverse roles. The social meaning of these words was then more demanding than modern customs would suggest. The guest-host relationship was bound by oaths and sacrifices so serious that Homer’s warriors, Glaukos and Diomedes, stopped fighting and presented gifts to each other when they learned that their *grandfathers* had shared a guest-host relationship. This mutual obligation to provide “hospitality” functioned as a bridge between social units (tribes, clans) that had ordinarily restricted these obligations to their kin or co-residents (*\*h₂erós-*). Guest-host relationships would have been very useful in a mobile herding economy, as a way of separating people who were moving through your territory with your assent from those who were unwelcome, unregulated, and therefore unprotected. The guest-host institution might have been among the critical identity-defining innovations that spread with the Yamnaya horizon.<sup>2</sup>

It is difficult to document a shift to a more mobile residence pattern five thousand years after the fact, but a few clues survive. Increased mobility can be detected in a pattern of brief, episodic use, abandonment, and, much later, re-use at many Yamnaya kurgan cemeteries; the absence of degraded or overgrazed soils under early Yamnaya kurgans; and the first appearance of kurgan cemeteries in the deep steppe, on the dry plateaus

between major river valleys. The principal indicator of increased mobility is a negative piece of evidence: the archaeological disappearance of long-term settlements east of the Don River. Yamnaya settlements are known west of the Don in Ukraine, but east of the Don in Russia there are no significant Yamnaya settlements in a huge territory extending to the Ural River containing many hundreds of excavated Yamnaya kurgan cemeteries and probably thousands of excavated Yamnaya graves (I have never seen a full count). The best explanation for the complete absence of settlements is that the eastern Yamnaya people spent much of their lives in wagons.

The Yamnaya horizon was the first more or less unified ritual, economic, and material culture to spread across the entire Pontic-Caspian steppe region, but it was never completely homogeneous even materially. At the beginning it already contained two major variants, on the lower Don and lower Volga, and, as it expanded, it developed other regional variants, which is why most archaeologists are reluctant to call it the Yamnaya “culture.” But many broadly similar customs were shared. In addition to kurgan graves, wagons, and an increased emphasis on pastoralism, archaeological traits that defined the early Yamnaya horizon included shell-tempered, egg-shaped pots with everted rims, decorated with comb stamps and cord impressions; tanged bronze daggers; cast flat axes; bone pins of various types; the supine-with-raised-knees burial posture; ochre staining on grave floors near the feet, hips, and head; northeastern to eastern body orientation (usually); and the sacrifice at funerals of wagons, carts, sheep, cattle, and horses. The funeral ritual probably was connected with a cult of ancestors requiring specific rituals and prayers, a connection between language and cult that introduced late Proto-Indo-European to new speakers.

The most obvious material division within the early Yamnaya horizon was between east and west. The eastern (Volga-Ural-North Caucasian steppe) Yamnaya pastoral economy was more mobile than the western one (South Bug-lower Don). This contrast corresponds in an intriguing way to economic and cultural differences between eastern and western Indo-European language branches. For example, impressions of cultivated grain have been found in western Yamnaya pottery, in both settlements and graves, and Proto-Indo-European cognates related to cereal agriculture were well preserved in western Indo-European vocabularies. But grain imprints are absent in eastern Yamnaya pots, just as many of the cognates related to agriculture are missing from the eastern Indo-European languages.<sup>3</sup> Western Indo-European vocabularies contained a few roots that were borrowed from Afro-Asiatic languages, such as the word for the

domesticated bull, *\*tawr-*, and the western Yamnaya groups lived next to the Tripolye culture, which might have spoken a language distantly derived from an Afro-Asiatic language of Anatolia. Eastern Indo-European generally lacked these borrowed Afro-Asiatic roots. Western Indo-European religious and ritual practices were female-inclusive, and western Yamnaya people shared a border with the female-figurine-making Tripolye culture: eastern Indo-European rituals and gods, however, were more male-centered, and eastern Yamnaya people shared borders with northern and eastern foragers who did not make female figurines. In western Indo-European branches the spirit of the domestic hearth was female (Hestia, the Vestal Virgins), and in Indo-Iranian it was male (Agni). Western Indo-European mythologies included strong female deities such as Queen Magb and the Valkyries, whereas in Indo-Iranian the furies of war were male Maruts. Eastern Yamnaya graves on the Volga contained a higher percentage (80%) of males than any other Yamnaya region. Perhaps this east-west tension in attitudes toward gender contributed to the separation of the feminine gender as a newly marked grammatical category in the dialects of the Volga-Ural region, one of the innovations that defined Proto-Indo-European grammar.<sup>4</sup>

Did the Yamnaya horizon spread into neighboring regions in a way that matches the known relationships and sequencing between the Indo-European branches? This also is a difficult subject to follow archaeologically, but the movements of the Yamnaya people match what we would expect surprisingly well. First, just before the Yamnaya horizon appeared, the Repin culture of the Volga-Ural region threw off a subgroup that migrated across the Kazakh steppes about 3700–3500 BCE and established itself in the western Altai, where it became the Afanasievo culture. The separation of the Afanasievo culture from Repin probably represented the separation of Pre-Tocharian from classic Proto-Indo-European. Second, some three to five centuries later, about 3300 BCE, the rapid diffusion of the early Yamnaya horizon across the Pontic-Caspian steppes scattered the speakers of late Proto-Indo-European dialects and sowed the seeds of regional differentiation. After a pause of only a century or two, about 3100–3000 BCE, a large migration stream erupted from within the western Yamnaya region and flowed up the Danube valley and into the Carpathian Basin during the Early Bronze Age. Literally thousands of kurgans can be assigned to this event, which could reasonably have incubated the ancestral dialects for several western Indo-European language branches, including Pre-Italic and Pre-Celtic. After this movement slowed or stopped, about 2800–2600 BCE, late Yamnaya people came face to face

with people who made Corded Ware tumulus cemeteries in the east Carpathian foothills, a historic meeting through which dialects ancestral to the northern Indo-European languages (Germanic, Slavic, Baltic) began to spread among eastern Corded Ware groups. Finally, at the end of the Middle Bronze Age, about 2200–2000 BCE, a migration stream flowed from the late Yamnaya/Poltavka cultures of the Middle Volga–Ural region eastward around the southern Urals, creating the Sintashta culture, which almost certainly represented the ancestral Indo-Iranian–speaking community. These migrations are described in chapters 14 and 15.

The Yamnaya horizon meets the expectations for late Proto-Indo-European in many ways: chronologically (the right time), geographically (the right place), materially (wagons, horses, animal sacrifices, tribal pastoralism), and linguistically (bounded by persistent frontiers); and it generated migrations in the expected directions and in the expected sequence. Early Proto-Indo-European probably developed between 4000 and 3500 BCE in the Don–Volga–Ural region. Late Proto-Indo-European, with o-stems and the full wagon vocabulary, expanded rapidly across the Pontic–Caspian steppes with the appearance of the Yamnaya horizon beginning about 3300 BCE. By 2500 BCE the Yamnaya horizon had fragmented into daughter groups, beginning with the appearance of the Catacomb culture in the Don–Kuban region and the Poltavka culture in the Volga–Ural region about 2800 BCE. Late Proto-Indo-European also was so diversified by 2500 BCE that it probably no longer existed (chapter 3). Again, the linkage with the steppe archaeological evidence is compelling.

#### WHY NOT A KURGAN CULTURE?

Marija Gimbutas first articulated her concept of a “Kurgan culture” as the archaeological expression of the Proto-Indo-European language community in 1956.<sup>5</sup> The Kurgan culture combined two cultures first defined by V. A. Gorodtsov, who, in 1901, excavated 107 kurgans in the Don River valley. He divided his discoveries into three chronological groups. The oldest graves, stratified deepest in the oldest kurgans, were the Pit-graves (Yamnaya). They were followed by the Catacomb–graves (Katakombnaya), and above them were the timber–graves (Srubnaya). Gorodtsov’s sequence still defines the Early (EBA), Middle (MBA), and Late Bronze Age (LBA) grave types of the western steppes.<sup>6</sup> Gimbutas combined the first two (EBA Pit–graves and MBA Catacomb–graves) into the Kurgan culture. But later she also began to include many other Late Neolithic and

Bronze Age cultures of Europe, including the Maikop culture and many of the Late Neolithic cultures of eastern Europe, as outgrowths or creations of Kurgan culture migrations. The Kurgan culture was so broadly defined that almost any culture with burial mounds, or even (like the Baden culture) without them could be included. Here we are discussing the steppe cultures of the Russian and Ukrainian EBA, just one part of the original core of Gimbutas's Kurgan culture concept. Russian and Ukrainian archaeologists do not generally use the term "Kurgan culture"; rather than lumping EBA Yamnaya and MBA Catacomb-graves together they tend to divide both groups and their associated time periods into ever finer slices. I will seek a middle ground.

The Yamnaya horizon is usually described by Slavic archaeologists not as a "culture" but as a "cultural-historical community." This phrase carries the implication that there was a thread of cultural identity or shared ethnic origin running through the Yamnaya social world, although one that diversified and evolved with the passage of time.<sup>7</sup> Although I agree that this probably was true in this case, I will use the Western term "horizon," which is neutral about cultural identity, in order to avoid using a term loaded toward that interpretation. As I explained in chapter 7, a horizon in archaeology is a style or fashion in material culture that is rapidly accepted by and superimposed on local cultures across a wide area. In this case, the five Pontic-Caspian cultures of the Final Eneolithic (chapter 12) were the local cultures that rapidly accepted, in varying degrees, the Yamnaya lifestyle.

#### BEYOND THE EASTERN FRONTIER: THE AFANASIEVO MIGRATION TO THE ALTAI

In the last chapter I introduced the subject of the trans-continental, Repin-culture migration that created the Afanasievo culture in the western Altai Mountains and probably detached the Tocharian branch from common Proto-Indo-European. I describe it here because the process of migration and return migration that installed the early Afanasievo culture continued across the north Kazakh steppes during the Yamnaya period. In fact, it is usually discussed as an event connected with the Yamnaya horizon; it is only recently that early Afanasievo radiocarbon dates, and the broadening understanding of the age and geographic extent of the Repin culture, have pushed the beginning of the movement back into the pre-Yamnaya Repin period.

Two or three centuries before the Yamnaya horizon first appeared, the Repin-type communities of the middle Volga-Ural steppes experienced a



### YAMNAYA SOCIAL ORGANIZATION

The speakers of late Proto-Indo-European expressed thanks for sons, fat cattle, and swift horses to Sky Father, *\*dyew pater*, a male god whose prominence probably reflected the importance of fathers and brothers in the herding units that composed the core of earthly social organization. The vocabulary for kin relations in Proto-Indo-European was that of a people who lived in a patrilineal, patrilocal social world, meaning that rights, possessions, and responsibilities were inherited only from the father (not the mother), and residence after marriage was with or near the husband's family. Kinship terms referring to grandfather, father, brother, and husband's brother survive in clearly corresponding roots in nearly all Indo-European languages, whereas those relating to wife and wife's family are few, uncertain, and variable. Kinship structure is only one aspect of social organization, but in tribal societies it was the glue that held social units together. We will see, however, that where the linguistic evidence suggests a homogeneous patri-centered Proto-Indo-European kinship system, the archaeological evidence of actual behavior is more variable.

As Jim Mallory admitted years ago, we know very little about the social meanings of kurgan cemeteries, and kurgan cemeteries are all the archaeological evidence left to us over much of the Yamnaya world.<sup>37</sup> We can presume that they were visible claims to territory, but we do not know the rules by which they were first established or who had the right to be buried there or how long they were used before they were abandoned. Archaeologists tend to write about them as static finished objects, but when they were first made they were dynamic, evolving monuments to specific people, clans, and events.

#### *Gender and the Meaning of Kurgan Burial*

We can be confident that kurgans were not used as family cemeteries. Mallory's review of 2,216 Yamnaya graves showed that the median Yamnaya kurgan contained fewer than 3 Yamnaya graves. About 25% contained just 1 grave. Children never were buried alone in the central or principal grave—that status was limited to adults. A count of kurgans per century in the well-studied and well-dated Samara River valley, in the middle Volga region, indicated that Yamnaya kurgans were built rarely, only one every five years or so even in regions with many Yamnaya cemeteries. So kurgans commemorated the deaths of special adults, not of everyone in the social

group or even of everyone in the distinguished person's family. In the lower Volga, 80% of the Yamnaya graves contained males. E. Murphy and A. Khokhlov have confirmed that 80% of the sexable Yamnaya-Poltavka graves in the middle Volga region also contained males. In Ukraine, males predominated but not as strongly. In the steppes north of the North Caucasus, both in the eastern Manych steppes and in the western Kuban-Azov steppes, females and males appeared about equally in central graves and in kurgan graves generally. Mallory described the near-equal gender distribution in 165 Yamnaya graves in the eastern Manych region, and Gei gave similar gender statistics for 400 Novotitorovskaya graves in the Kuban-Azov steppes. Even in the middle Volga region some kurgans have central graves containing adult females, as at Krasnosamarskoe IV. Males were not always given the central place under kurgans even in regions where they strongly tended to occupy the central grave, and in the steppes north of the North Caucasus (where Maikop influence was strongest before the Yamnaya period) males and females were buried equally.<sup>38</sup>

The male-centered funerals of the Volga-Ural region suggest a more male-centered eastern social variant within the Yamnaya horizon, an archaeological parallel to the male-centered deities reconstructed for eastern Indo-European mythological traditions. But even on the Volga the people buried in central graves were not *exclusively* males. In the patrilocal, patrilineal society reconstructed by linguists for Proto-Indo-European speakers, *all* lineage heads would have been males. The appearance of adult females in one out of five kurgan graves, including central graves, suggests that gender was not the only factor that determined who was buried under a kurgan. Why were adult females buried in central graves under kurgans even on the Volga? Among later steppe societies women could occupy social positions normally assigned to men. About 20% of Scythian-Sarmatian "warrior graves" on the lower Don and lower Volga contained females dressed for battle as if they were men, a phenomenon that probably inspired the Greek tales about the Amazons. It is at least interesting that the frequency of adult females in central graves under Yamnaya kurgans in the same region, but two thousand years earlier, was about the same. Perhaps the people of this region customarily assigned some women leadership roles that were traditionally male.<sup>39</sup>

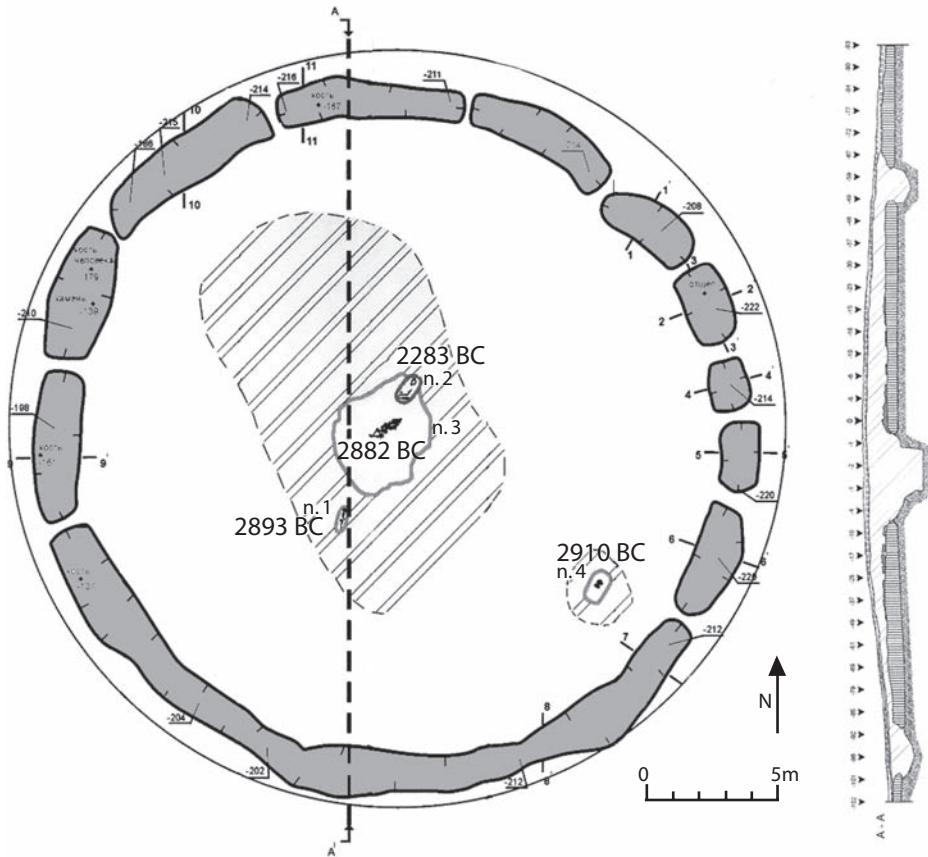
#### *Kurgan Cemeteries and Mobility*

Were the kurgans in a cemetery built together in a rapid sequence and then abandoned, or did people stay around them and use them regularly

for longer periods of time? For interval dating *between* kurgans it would be ideal to obtain radiocarbon dates from all the kurgans in a cemetery. In a Yamnaya cemetery, that would usually be from three to as many as forty or fifty kurgans. Very few kurgan cemeteries have been subjected to this intensity of radiocarbon dating.

We can try to approximate the time interval between kurgans from the 210 radiocarbon dates on Yamnaya graves published in 2003 by Telegin and his colleagues. In his list we find nineteen Yamnaya kurgan cemeteries for which there are radiocarbon dates from at least two kurgans in the same cemetery. In eleven of these nineteen, more than half, at least two kurgans yielded radiocarbon dates that are statistically indistinguishable (see table 13.3 for radiocarbon dates). This suggests that kurgans were built rapidly in clusters. In many cases, the cemetery was then abandoned for a period of centuries before it was reused. For example, at the Poltavka cemetery of Krasnosamarskoe IV in the middle Volga region we can show this pattern, because we excavated all three kurgans in a small kurgan group and obtained multiple radiocarbon dates from each (figure 13.7). Like many kurgan groups in Ukraine, all three kurgans here were built within an indistinguishably brief time. The central graves all dated about 2700–2600 BCE (dates reduced by 200 radiocarbon years to account for the measured  $^{15}\text{N}$  in the human bone used for the date), and then the cemetery was abandoned. Cemeteries like Krasnosamarskoe IV were used intensively for very short periods.

If pastures were like the cemeteries that marked them, then they were used briefly and abandoned. This episodic pasturing pattern, similar to swidden horticulture, possibly was encouraged by similar conditions—a low-productivity environment demanding frequent relocation. But herding, unlike swidden horticulture, required large pastures for each animal, and it could produce trade commodities (wool, felt, leather) if the herds were sufficiently large. To “rest” pastures under these circumstances would have been attractive only at low population densities.<sup>40</sup> It could have happened when the new Yamnaya economy was expanding into the previously unexploited pastures between the river valleys. But as the population of wagon-driving herders grew during the Early Bronze Age, some pastures began to show signs of overuse. A. A. Golyeva established that EBA Yamnaya kurgans in the Manych steppes were built on pristine soils and grasses, but many MBA Catacomb-culture kurgans were built on soils that had already been overgrazed.<sup>41</sup> Yamnaya kurgan cemeteries were dynamic aspects of a new herding system during its initial expansionary phase.



*Figure 13.7 Krasnosamarskoe cemetery IV, kurgan 1, early Poltavka culture on the middle Volga. Three graves were created simultaneously when the kurgan was raised, about 2800 BCE: the central grave, covered by a layer of clay, a peripheral grave to its southeast, and an overlying grave in the kurgan. Author's excavation.*

## *Proto-Indo-European Chiefs*

The speakers of Proto-Indo-European followed chiefs (*\*weik-potis*) who sponsored feasts and ceremonies and were immortalized in praise poetry. The richer Yamnaya graves probably commemorated such individuals. The dim outlines of a social hierarchy can be extracted from the amount of labor required to build kurgans. A larger kurgan probably meant that a larger number of people felt obligated to respond to the death of the person

buried in the central grave. Most graves contained nothing but the body, or in some cases just the head, with clothing, perhaps a bead or two, reed mats, and wooden beams. The skin of a domestic animal with a few leg or head bones attached was an unusual gift, appearing in about 15% of graves, and a copper dagger or axe was very rare, appearing in less than 5%. Sometimes a few sherds of pottery were thrown into the grave. It is difficult to define social roles on the basis of such slight evidence.

Do big kurgans contain the richest graves? Kurgan size and grave wealth have been compared in at least two regions, in the Ingul River valley west of the Dnieper in Ukraine (a sample of 37 excavated Yamnaya kurgans), and in the Volga-Ural region (a sample of more than 90 kurgans).<sup>42</sup> In both regions kurgans were easily divided into widely disparate size classes—three classes in Ukraine and four on the Volga. In both regions the class 1 kurgans were 50 m or more in diameter, about the width of a standard American football field (or two-thirds the width of a European soccer field), and their construction required more than five hundred man-days, meaning that five hundred people might have worked for one day to build them, or one hundred people for five days, or some other combination totaling five hundred.

The biggest kurgans were not built over the richest central graves in either region. Although the largest class 1 kurgans did contain rich graves, so did smaller kurgans. In both regions wealthy graves occurred both in the central position under a kurgan and in peripheral graves. In the Ingul valley, where there were no metal-rich graves in the study sample, more objects were found in peripheral graves than in central graves. In some cases, where we have radiocarbon dates for many graves under a single kurgan, we can establish through overlapping radiocarbon dates that the central grave and a *richer* peripheral grave were dug simultaneously in a single funeral ceremony, as at Krasnosamarskoe IV. The richest graves in some Novosvobodnaya kurgans, including the Klady cemetery, were peripheral graves, located off-center under the mound. It could be misleading to count the objects in peripheral graves, including some wheeled vehicle sacrifices, as separate from the central grave. In at least some cases, a richer peripheral grave accompanied the central grave in the same funeral ceremony.

Elite status was marked by artifacts as well as architecture, and the most widespread indication of status was the presence of metal grave goods. The largest metal artifact found in any Yamnaya grave was laid on the left arm of a male buried in Kutuluk cemetery I, kurgan 4, overlooking the Kinel River, a tributary of the Samara River in the Samara oblast east of the



*Figure 13.8* Kutuluk cemetery I, kurgan 4, grave 1, middle Volga region. An Early Yamnaya male with a large copper mace or club, the heaviest metal object of the Yamnaya horizon. Photograph and excavation by P. Kuznetsov; see Kuznetsov 2005.

Volga (figure 13.8). A solid copper club or mace weighing 750 gm, it was 48.7 cm long and more than 1 cm thick, with a diamond cross-section. The kurgan was medium-sized, 21 m in diameter and less than 1 m high, but the central grave pit (gr. 1) was large. The male was oriented east, positioned supine with raised knees, with ochre at his head, hips, and feet—a classic early Yamnaya grave type. Two samples of bone taken from his

skeleton were dated about 3100–2900 BCE ( $4370 \pm 75$  AA12570 and  $4400 \pm 70$  BP OxA 4262), but  $^{15}\text{N}$  levels suggest that the date probably was too old and should be revised to about 2900–2700 BCE.

In the Samara River valley, near the village of Utyevka on the floodplain of the Samara River, was the richest steppe grave of the Yamnaya-Poltavka period. Utyevka cemetery I, kurgan 1 was 110 m in diameter. Central grave 1 was a Yamnaya-Poltavka grave containing an adult male, positioned supine with legs in an uncertain position. He was buried with two golden rings with granulated decoration, unique objects with analogies in the North Caucasus or Anatolia; also a copper tanged dagger, a copper pin with a forged iron head, a flat copper axe, a copper awl, a copper sleeved axe of the classic Volga-Ural type IIa with a slightly rising blade, and a polished stone pestle<sup>43</sup> (figure 13.9). In the Volga-Ural region numerous Yamnaya graves contained metal daggers, chisels, and cast shaft-hole axes.

Overall, the wide disparities in labor invested in kurgans of different sizes, from 10 m to more than 110 m in diameter, indicate a broad socio-political hierarchy, though one not always correlated with grave wealth. The class 1 kurgans tended to contain rich graves but they were not always the central grave, and rich graves frequently occurred in smaller kurgans. Chernykh observed that kurgans seem to have been bigger, as a rule, in the North Pontic steppes, where many also had additional stone elements including cromlechs or curbs, carved stone stelae, and even coverings of stone or gravel, whereas the graves of the Volga-Ural region were richer in metal but had simpler earthen monuments.<sup>44</sup>

### *The Identity of the Metalworker*

The craft of the steppe metalsmith improved and became more sophisticated under Yamnaya chiefs. Metalworkers in the Pontic-Caspian steppes made cast-copper objects regularly for the first time, and in late Yamnaya they even experimented with forged iron. Thin seams of copper ore (azurite, malachite) are interbedded with iron-bearing sandstones between the central North Caucasus region (Krasnodar) and the Ural Mountains (Kargaly), including the entire Volga-Ural region. These ores are exposed by erosion on the sides of many stream valleys, and were mined by Yamnaya metalworkers. A Yamnaya grave at Pershin in Orenburg oblast, near the enormous copper deposits and mines at Kargaly on the middle Ural River, contained a male buried with a two-piece mold for a sleeved, one-bladed axe of Chernykh's type 1. The grave is dated about 2900–2700 BCE



*Figure 13.9* Utyevka cemetery I, kurgan 1, grave 1, between 2800 and 2500 BCE, middle Volga region. The richest grave and among the largest kurgans (more than 100 m in diameter) of the Yamnaya-Poltavka horizon. Gold rings with granulated decoration, ceramic vessel, copper shaft-hole axe, copper dagger, copper pin with iron head, copper flat axe, copper awl, and stone pestle. After Vasiliev 1980.

( $4200 \pm 60$ , BM-3157). A Yamnaya mining pit has been found at Kargaly with radiocarbon dates of the same era. Almost all the copper objects from the Volga-Ural region were made of “clean” copper from these local sources. Although the cast sleeved single-bladed axes and tanged daggers of the early Yamnaya period imitated Novosvobodnaya originals, they were made locally from local copper ores. North Caucasian arsenical bronze was imported by people buried in graves in the Kalmyk steppe south of the lower Volga and in Kemi-Oba sites on the Crimean peninsula, but not in the Volga-Ural steppes.<sup>45</sup>

The grave at Pershin was not the only smith’s grave of the period. Metalworkers were clearly identified in several Yamnaya-period graves, perhaps because metalworking was still a form of shamanic magic, and the tools remained dangerously polluted by the spirit of the dead smith. Two Post-Mariupol smith’s graves on the Dnieper (chapter 12) probably were contemporary with early Yamnaya, as was a smith’s grave with axe molds, crucibles, and *tulieres* in a Novotitorovskaya-culture grave in the Kuban steppes at Lebedi I (figure 13.10). Copper slag, the residue of metalworking, was included in other graves, as at Utyevka I kurgan 2.<sup>46</sup>

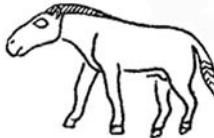
One unappreciated aspect of EBA and MBA steppe metallurgy was its experimentation with iron. The copper pin in Utyevka kurgan 1 with a forged iron head was not unique. A Catacomb-period grave at Gerasimovka on the Donets, probably dated around 2500 BCE, contained a knife with a handle made of arsenical bronze and a blade made of iron. The iron did not contain magnetite or nickel, as would be expected in meteoric iron, so it is thought to have been forged. Iron objects were rare, but they were part of the experiments conducted by steppe metalsmiths during the Early and Middle Bronze Ages, long before iron began to be used in Hittite Anatolia or the Near East.<sup>47</sup>

### THE STONE STELAE OF THE NORTH PONTIC STEPPE

The Yamnaya horizon developed in the Pontic-Caspian steppes largely because an innovation in land transport, wagons, was added to horseback riding to make a new kind of herding economy possible. At the same time an innovation in sea transport, the introduction of the multi-oared long-boat, probably was responsible for the permanent occupation of the Cycladic Islands by Grotta-Pelos mariners about 3300–3200 BCE, and for the initial development of the northwest Anatolian trading communities such as Kum Tepe that preceded the founding of Troy.<sup>48</sup> These two horizons, one on the sea and the other on a sea of grass, came into contact around the shores of the Black Sea.



## CHAPTER FOURTEEN



### The Western Indo-European Languages

“A wild river full of possibilities flowed from my new tongue.”

—Andrew Lam, *Learning a Language, Inventing a Future* 2006

We will not understand the early expansion of the Proto-Indo-European dialects by trying to equate language simply with artifact types. Material culture often has little relationship to language. I have proposed an exception to that rule in the case of robust and persistent frontiers, but that does seem to be an exception. The essence of language expansion is psychological. The initial expansion of the Indo-European languages was the result of widespread cultural shifts in group self-perception. Language replacement always is accompanied by revised self-perceptions, a restructuring of the cultural classifications within which the self is defined and reproduced. Negative evaluations associated with the dying language lead to a descending series of reclassifications by succeeding generations, until no one wants to speak like Grandpa any more. Language shift and the stigmatization of old identities go hand in hand.

The pre-Indo-European languages of Europe were abandoned because they were linked to membership in social groups that became stigmatized. How that process of stigmatization happened is a fascinating question, and the possibilities are much more varied than just invasion and conquest. Increased out-marriage, for example, can lead to language shift. The Gaelic spoken by Scottish “fisher” folk was abandoned after World War II, when increased mobility and new economic opportunities led to out-marriage between Gaelic “fishers” and the surrounding English-speaking population, and the formerly tightly closed and egalitarian “fisher” community became intensely aware both of its low ranking in a larger world and of alternative economic opportunities. Gaelic rapidly disappeared, although only a few people—soldiers, professionals, teachers—moved very far. Similarly, the general situation in Europe after 3300 BCE was one of increased

mobility, new pastoral economies, explicitly status-ranked political systems, and inter-regional connectivity—exactly the kind of context that might have led to the stigmatization of the tightly closed identities associated with languages spoken by localized groups of village farmers.<sup>1</sup>

The other side of understanding language shift is to ask why the identities associated with Indo-European languages were emulated and admired. It cannot have been because of some essential quality or inner potential in Indo-European languages or people. Usually language shift flows in the direction of paramount prestige and power. Paramount status can attach to one ethnic group (Celt, Roman, Scythian, Turk, American) for centuries, but eventually it flows away. So we want to know what in this particular era attached prestige and power to the identities associated with Proto-Indo-European speech—Yamnaya identities, principally. At the beginning of this period, Indo-European languages still were spoken principally by pastoral societies from the Pontic-Caspian steppes. Five factors probably were important in enhancing their status:

1. Pontic-Caspian steppe societies were more familiar with horse breeding and riding than anyone outside the steppes. They had many more horses than anywhere else, and measurements show that their steppe horses were larger than the native marsh and mountain ponies of central and western Europe. Larger horses appeared in Baden, Cernavoda III, and Cham sites in central Europe and the Danube valley about 3300–3000 BCE, probably imported from the steppes.<sup>2</sup> Horses began to appear commonly in most sites of the ETC culture in Transcaucasia at the same time, and larger horses appeared among them, as in southeastern Anatolia at Norşuntepe. Steppe horse-breeders might also have had the most manageable male bloodline—the genetic lineage of the original domesticated male founder was preserved even in places with native wild populations (see chapter 10). If they had the largest, strongest, *and* most manageable horses, and they had more than anyone else, steppe societies could have grown rich by trading horses. In the sixteenth century the Bukhara khanate in Central Asia, drawing on horse-breeding grounds in the Ferghana valley, exported one hundred thousand horses *annually* just to one group of customers: the Mughal rulers of India and Pakistan. Although I am not suggesting anything near that scale, the annual demand for steppe horses in Late Eneolithic/Early Bronze Age Europe could easily have totaled thousands of animals during the initial expansion of horseback riding beyond the steppes. That would have made some steppe horse dealers wealthy.<sup>3</sup>

2. Horseback riding shortened distances, so riders traveled farther than walkers. In addition to the conceptual changes in human geography this caused, riders gained two functional advantages. First, they could manage herds larger than those tended by pedestrian herders, and could move those larger herds more easily from one pasture to another. Any single herder became more productive on horseback. Second, they could advance to and retreat from raids faster than pedestrian warriors. Riders could show up unexpectedly, dismount and attack people in their fields, run back to their horses and get away quickly. The decline in the economic importance of cultivation across Europe after 3300 BCE occurred in a social setting of increased levels of warfare almost everywhere. Riding probably added to the general increase in insecurity, making riding more necessary, and expanding the market for horses (see paragraph above).

3. Proto-Indo-European institutions included a belief in the sanctity of verbal contracts bound by oaths (*\*h₂óitos*), and in the obligation of patrons (or gods) to protect clients (or humans) in return for loyalty and service. “Let this racehorse bring us good cattle and good horses, male children and all-nourishing wealth,” said a prayer accompanying the sacrifice of a horse in the *Rig Veda* (I.162), a clear statement of the contract that bound humans to the gods. In Proto-Indo-European religion generally the chasm between gods and humans was bridged by the sanctity of oath-bound contracts and reciprocal obligations, so these were undoubtedly important tools regulating the daily behavior of the powerful toward the weak, at least for people who belonged under the social umbrella. Patron-client systems like this could incorporate outsiders as clients who enjoyed rights and protection. This way of legitimizing inequality probably was an old part of steppe social institutions, going back to the initial appearance of differences in wealth when domesticated animals were accepted.<sup>4</sup>

4. With the evolution of the Yamnaya horizon, steppe societies must have developed a political infrastructure to manage migratory behavior. The change in living patterns and mobility described in the previous chapter cannot have happened without social effects. One of those might have been the creation of mutual obligations of “hospitality” between guest-hosts (*\*ghos-ti-*). This institution, discussed in the last chapter, redefined who belonged under the social umbrella, and extended protection to new groups. It would have been very useful as a new way to incorporate outsiders as people with clearly defined rights and protections, as it was used from *The Odyssey* to medieval Europe.<sup>5</sup> The apparent absence of this root in Anatolian and Tocharian suggests that this might have been a new development connected with the migratory behavior of the early Yamnaya horizon.

5. Finally, steppe societies had created an elaborate political theater around their funerals, and perhaps on more cheerful public occasions as well. Proto-Indo-European contained a vocabulary related to gift giving and gift taking that is interpreted as referring to potlatch-like feasts meant to build prestige and display wealth. The public performance of praise poetry, animal sacrifices, and the distribution of meat and mead were central elements of the show. Calvert Watkins found a special kind of song he called the “praise of the gift” in Vedic, Greek, Celtic, and Germanic, and therefore almost certainly in late Proto-Indo-European. Praise poems proclaimed the generosity of a patron and enumerated his gifts. These performances were both acclamations of identity and recruiting events.<sup>6</sup>

Wealth, military power, and a more productive herding system probably brought prestige and power to the identities associated with Proto-Indo-European dialects after 3300 BCE. The guest-host institution extended the protections of oath-bound obligations to new social groups. An Indo-European-speaking patron could accept and integrate outsiders as clients without shaming them or assigning them permanently to submissive roles, as long as they conducted the sacrifices properly. Praise poetry at public feasts encouraged patrons to be generous, and validated the language of the songs as a vehicle for communicating with the gods who regulated everything. All these factors taken together suggest that the spread of Proto-Indo-European probably was more like a franchising operation than an invasion. Although the initial penetration of a new region (or “market” in the franchising metaphor) often involved an actual migration from the steppes and military confrontations, once it began to reproduce new patron-client agreements (franchises) its connection to the original steppe immigrants became genetically remote, whereas the myths, rituals, and institutions that maintained the system were reproduced down the generations.<sup>7</sup>

#### THE END OF THE CUCUTENI-TRIPOLYE CULTURE AND THE ROOTS OF THE WESTERN BRANCHES

In this chapter we examine the archaeological evidence associated with the initial expansion of the western Indo-European languages, including the separation of Pre-Germanic, the ultimate ancestor of English. It is possible to connect prehistoric languages with archaeological cultures in this particular time and place *only* because the possibilities are already constrained by three critical parameters. These are (1) that the late Proto-Indo-European dialects did expand; (2) that they expanded into eastern and central Europe



Many Yamnaya kurgans in the lower Danube valley contained Cotsofeni ceramic vessels. The Cotsofeni culture evolved in mountain refuges in western Romania and Transylvania beginning about 3500 BCE, probably from Old European roots. Cotsofeni settlements were small agricultural hamlets of a few houses. Their owners cremated their dead and buried the ashes in flat graves, some of which contained riveted daggers like Usatovo daggers.<sup>28</sup> When Yamnaya herders reached the plains around Craiova, they probably realized that control over this region was the key to movement up and down the Danube valley through the mountain passes around the Iron Gates. They established alliances or patron-client contracts with the leaders of the Cotsofeni communities, through which they obtained Cotsofeni pottery (and probably other less visible Cotsofeni products), as Usatovo patrons obtained Tripolye pottery. Cotsofeni pottery then was carried into other regions by Yamnaya people. A Cotsofeni vessel was found in a Yamnaya kurgan as far afield as Tarakliya, Moldova, probably in the grave of a returned migrant. In northwestern Bulgaria, kurgan 1 at Tarnava (figure 14.6) contained an unusual concentration of six Cotsofeni pots in six Yamnaya graves.<sup>29</sup> Most of the Yamnaya kurgans in Bulgaria contained no ceramics, but, when they did, they were often Cotsofeni ceramics.

The situation of the Yamnaya chiefs might have been similar to that described by Barth in his account of the Yusufai Pathan invasion of the Swat valley in Pakistan in the sixteenth century. The invader, “faced with the sea of politically undifferentiated villagers proceeds to organize a central island of authority, and from this island he attempts to exercise authority over the surrounding sea. Other landowners establish similar islands, some with overlapping spheres of influence, others having unadministered gaps between them.”<sup>30</sup> The mechanism through which the immigrant chief made himself indispensable to the villagers and tied them to him was the creation of a contract in which he guaranteed protection, hospitality, and the recognition of the villagers’ rights to agricultural production in exchange for their loyalty, service, and best land. Yamnaya herding groups needed more land for pastures than did farming groups of equal population, and this could have provided a rationale for the Yamnaya people to claim use-rights over most of the available pasture lands and the migration routes that linked them, eventually creating a web of landownership that covered much of southeastern Europe. The reestablishment of tell settlements in the Balkans might have been part of a newly bifurcated economy in which farmers settled on fortified tells and increased grain production in response to reductions in their pastures, taken by their Yamnaya patrons.



split away from a later set of developing Indo-European dialects and languages, not from Proto-Indo-European itself. Greek shared traits with Armenian and Phrygian, both of which probably descended from languages spoken in southeastern Europe before 1200 BCE, so Greek shared a common background with some southeastern European languages that might have evolved from the speech of the Yamnaya immigrants in Bulgaria. As noted in chapter 3, Pre-Greek also shared many traits with pre-Indo-Iranian. This linguistic evidence suggests that Pre-Greek should have been spoken on the eastern border of southeastern Europe, where it could have shared some traits with Pre-Armenian and Pre-Phrygian on the west and pre-Indo-Iranian on the east. The early western Catacomb culture would fit these requirements (see figure 15.5), as it was in touch with southeastern Europe on one side and with the developing Indo-Iranian world of the east on the other. But it is impossible, as far as I know, to identify a Catacomb-culture migration that moved directly from the western steppes into Greece.

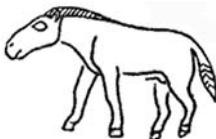
A number of artifact types and customs connect the Mycenaean Shaft Grave princes, the first definite Greek speakers at about 1650 BCE, with steppe or southeastern European cultures. These parallels included specific types of cheekpieces for chariot horses, specific types of socketed spearheads, and even the custom of making masks for the dead, which was common on the Ingul River during the late Catacomb culture, between about 2500 and 2000 BCE. It is very difficult, however, to define the specific source of the migration stream that brought the Shaft Grave princes into Greece. The people who imported Greek or Proto-Greek to Greece might have moved several times, perhaps by sea, from the western Pontic steppes to southeastern Europe to western Anatolia to Greece, making their trail hard to find. The EHII/III transition about 2400–2200 BCE has long been seen as a time of radical change in Greece when new people might have arrived, but the resolution of this problem is outside the scope of this book.<sup>36</sup>

#### CONCLUSION: THE EARLY WESTERN INDO-EUROPEAN LANGUAGES DISPERSE

There was no Indo-European invasion of Europe. The spread of the Ustovo dialect up the Dniester valley, if it happened as I have suggested, was quite different from the Yamnaya migration into the Danube valley. But even that migration was not a coordinated military invasion. Instead, a succession of Pontic steppe tribal segments fissioned from their home clans

and moved toward what they perceived as places with good pastures and opportunities for acquiring clients. The migrating Yamnaya chiefs then organized islands of authority and used their ritual and political institutions to establish control over the lands they appropriated for their herds, which required granting legal status to the local populations nearby, under patron-client contracts. Western Indo-European languages might well have remained confined to scattered islands across eastern and central Europe until after 2000 BCE, as Mallory has suggested.<sup>37</sup> Nevertheless, the movements into the East Carpathians and up the Danube valley occurred in the right sequence, at the right time, and in the right directions to be connected with the detachment of Pre-Italic, Pre-Celtic, and Pre-Germanic—the branch that ultimately gave birth to English.

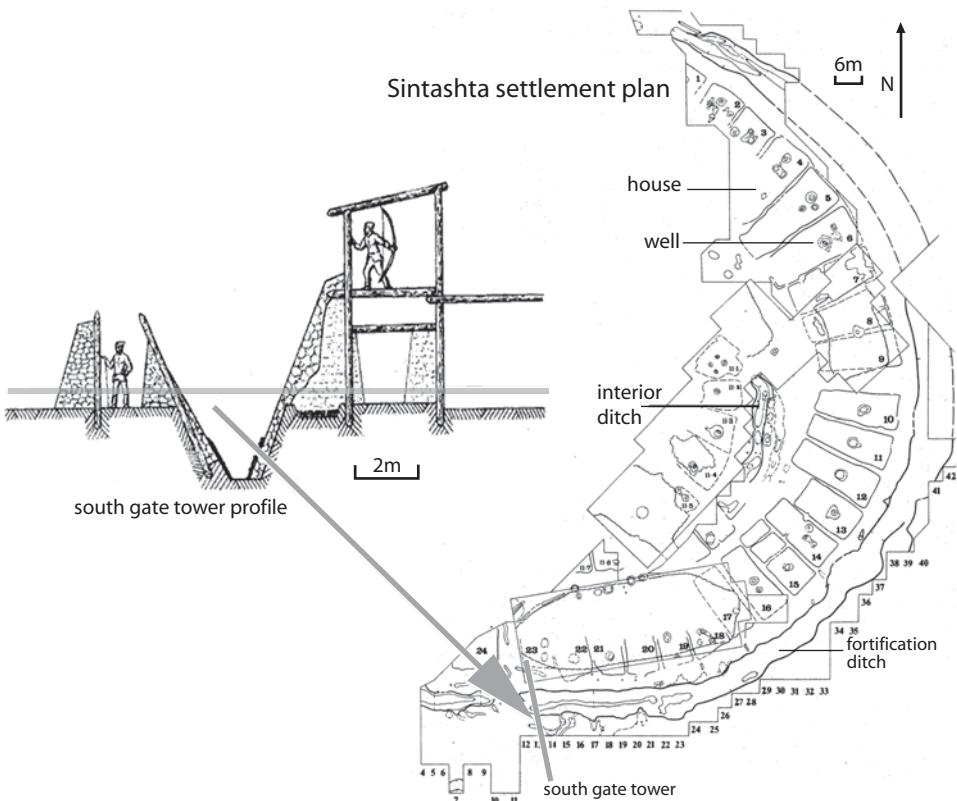
## CHAPTER FIFTEEN



### Chariot Warriors of the Northern Steppes

The publication of the book *Sintashta* in 1992 (in Russian) opened a new era in steppe archaeology.<sup>1</sup> Sintashta was a settlement east of the Ural Mountains in the northern steppes. The settlement and the cemeteries around it had been excavated by various archaeologists between 1972 and 1987. But only after 1992 did the significance of the site begin to become clear. Sintashta was a fortified circular town 140 m in diameter, surrounded by a timber-reinforced earthen wall with timber gate towers (figure 15.1). Outside the wall was a V-shaped ditch as deep as a man's shoulders. The Sintashta River, a western tributary of the upper Tobol, had washed away half of it, but the ruins of thirty-one houses remained. The original town probably contained fifty or sixty. Fortified strongholds like this were unprecedented in the steppes. A few smaller fortified settlements had appeared west of the Don (Mikhailovka, for example) during the Yamnaya period. But the walls, gates, and houses of Sintashta were much more substantial than at any earlier fortified site in the steppes. And inside each and every house were the remains of metallurgical activity: slag, ovens, hearths, and copper. Sintashta was a fortified metallurgical industrial center.

Outside the settlement were five funerary complexes that produced spectacular finds (figure 15.2). The most surprising discoveries were the remains of chariots, which radiocarbon dates showed were the oldest chariots known anywhere. They came from a cemetery of forty rectangular grave pits without an obvious kurgan labeled SM for *Sintashta mogila*, or *Sintashta cemetery*. The other four mortuary complexes were a mid-size kurgan (SI, for *Sintashta I*), 32 m in diameter and only 1 m high, that covered sixteen graves; a second flat or non-kurgan cemetery (SII) with ten graves; a second small kurgan (SIII), 16 m in diameter, that covered a single grave containing the partial remains of five individuals; and finally a huge kurgan, 85 m in diameter and 4.5 m high (SB, for *Sintashta bolshoi kurgan*), built over a central grave (robbed in antiquity) constructed of logs and sod on the



*Figure 15.1* The Sintashta settlement: rectangular houses arranged in a circle within a timber-reinforced earthen wall, with excavators' reconstruction of south gate tower and outer defense wall. After Gening, Zdanovich, and Gening 1992, figures 7 and 12.

original ground surface. The southern skirt of the SB kurgan covered, and so was later than, the northern edge of the SM cemetery, although the radiocarbon dates suggest that SM was only slightly older than SB. The forty SM graves contained astounding sacrifices that included whole horses, up to eight in and on a single grave (gr. 5), with bone disc-shaped cheekpieces, chariots with spoked wheels, copper and arsenical bronze axes and daggers, flint and bone projectile points, arsenical bronze socketed spearheads, polished stone mace heads, many ceramic pots, and a few small silver and gold ornaments (figure 15.3). What was impressive in these graves was weaponry, vehicles, and animal sacrifices, not crowns or jewelry.

## Sintashta settlement and cemeteries

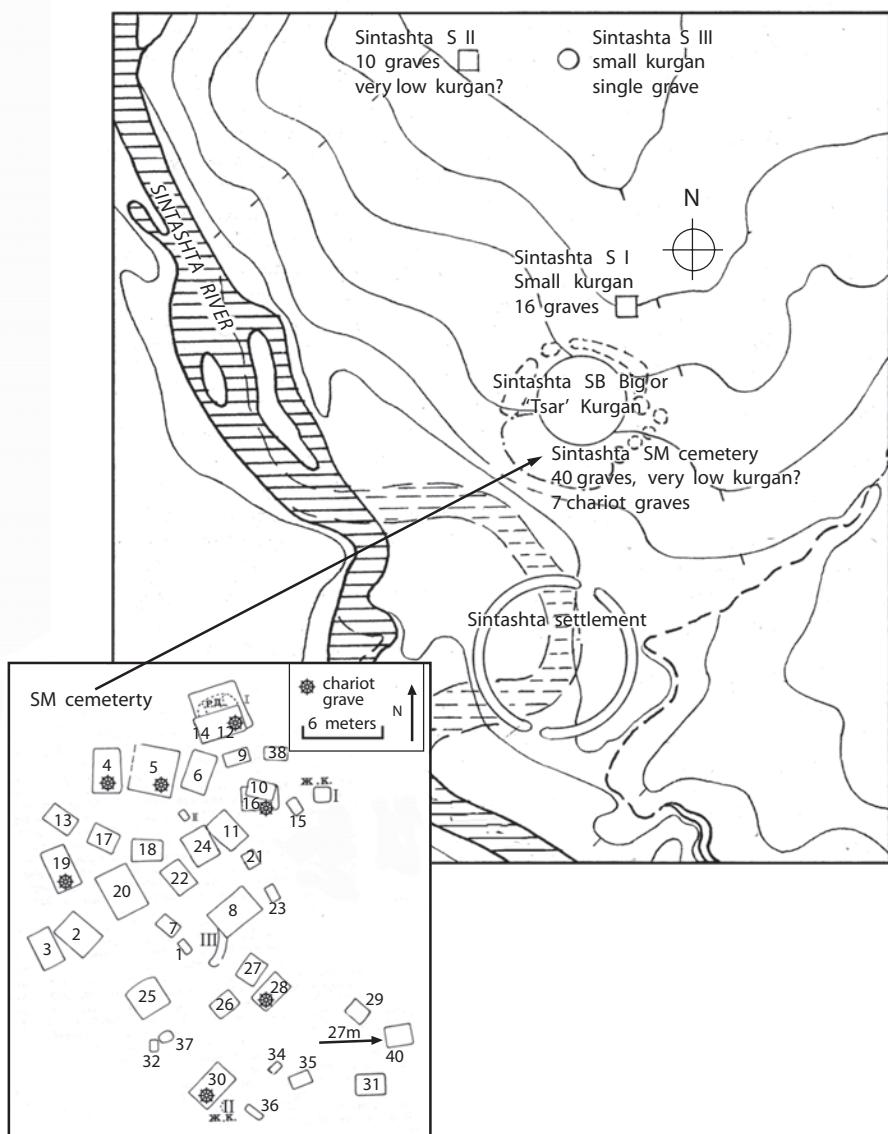


Figure 15.2 The Sintashta settlement landscape, with associated cemeteries, and detail of the SM cemetery. After Gening, Zdanovich, and Gening 1992, figures 2 and 42.

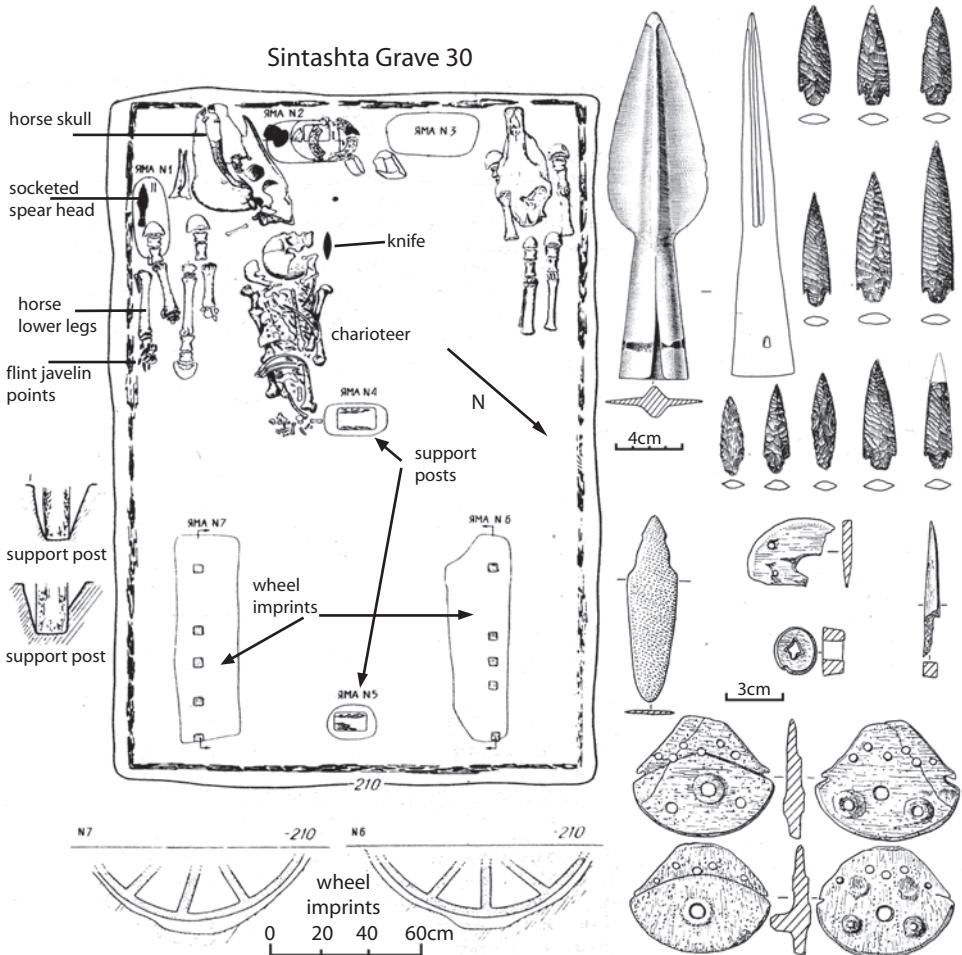


Figure 15.3 Sintashta SM cemetery, grave 30, with chariot wheel impressions, skulls and lower leg bones of horse team, cheekpieces for bits, and weapons. After Gening, Zdanovich, and Gening, figures 111, 113, and 114.

The radiocarbon dates for both the cemeteries and the settlement at Sintashta were worryingly diverse, from about 2800–2700 BCE ( $4200 \pm 100$  BP), for wood from grave 11 in the SM cemetery, to about 1800–1600 BCE ( $3340 \pm 60$  BP), for wood from grave 5 in the SII cemetery. Probably there was an older Poltavka component at Sintashta, as later was found at many other sites of the Sintashta type, accounting for the older dates. Wood from the central grave of the large kurgan (SB) yielded consistent

dates ( $3520+65$ ,  $3570+60$ , and  $3720+120$ ), or about 2100–1800 BCE. The same age range was produced by radiocarbon dates from the similar settlement at Arkaim, from several Sintashta cemeteries (Krivoе Ozero, Kammeny Ambar), and from the closely related graves of the Potapovka type in the middle Volga region (table 15.1).

The details of the funeral sacrifices at Sintashta showed startling parallels with the sacrificial funeral rituals of the *Rig Veda*. The industrial scale of metallurgical production suggested a new organization of steppe mining and metallurgy and a greatly heightened demand for copper and bronze. The substantial fortifications implied surprisingly large and determined attacking forces. And the appearance of Pontic-Caspian kurgan rituals, vehicle burials, and weapon types in the steppes east of the Ural River indicated that the Ural frontier had finally been erased.

After 1992 the flow of information about the Sintashta culture grew to a torrent, almost all of it in Russian and much of it still undigested or actively debated as I write.<sup>2</sup> Sintashta was just one of more than twenty related fortified settlements located in a compact region of rolling steppes between the upper Ural River on the west and the upper Tobol River on the east, southeast of the Ural Mountains. The settlement at Arkaim, excavated by G. B. Zdanovich, was not damaged by erosion, and twenty-seven of its fifty to sixty structures were exposed (figure 15.4). All the houses at Arkaim contained metallurgical production facilities. It has become a conference center and national historic monument. Sintashta and Arkaim raised many intriguing questions. Why did these fortified metal-producing towns appear in that place at that time? Why the heavy fortifications—who were they afraid of? Was there an increased demand for copper or just a new organization of copper working and mining or both? Did the people who built these strongholds invent chariots? And were they the original Aryans, the ancestors of the people who later composed the *Rig Veda* and the *Avesta*?<sup>3</sup>

#### THE END OF THE FOREST FRONTIER: CORDED WARE HERDERS IN THE FOREST

To understand the origins of the Sintashta culture we have to begin far to the west. In what had been the Tripolye region between the Dniester and Dnieper rivers, the interaction between Corded Ware, Globular Amphorae, and Yamnaya populations between 2800 and 2600 BCE produced a complicated checkerboard of regional cultures covering the rolling hills and valleys of the forest-steppe zone (figure 15.5). To the south, in the

TABLE 15.1

Selected radiocarbon dates for the Sintashta–Arkaim (S) and Potapovka (P) cultures in the south Ural steppes and middle Volga steppes.

<i>Lab Number</i>	<i>BP Date</i>	<i>Sample Source</i>	<i>C, K</i>	<i>Calibrated Date</i>
<b>Sintashta SB Big Kurgan (S)</b>				
GIN-6186	3670±40	birch log		2140–1970 BCE
GIN-6187	3510±40	“		1890–1740 BCE
GIN-6188	3510±40	“		1890–1740 BCE
GIN-6189	3260±40	“		1610–1450 BCE
<b>Sintashta SM cemetery (S)</b>				
Ki-653	4200±100	grave 11, wood	K	2900–2620 BC
Ki-658	4100±170	grave 39, wood	K	2900–2450 BC
Ki-657	3760±120	grave 28, wood	C	2400–1970 BC
Ki-864	3560±180	grave 19, wood	C	2200–1650 BCE
Ki-862	3360±70	grave 5, wood	C, K	1740–1520 BC
<b>Krivoe Ozero cemetery, kurgan 9, grave 1 (S)</b>				
AA-9874b	3740±50	horse 1 bone	C, K	2270–2030 BC
AA-9875a	3700±60	horse 2 bone		2200–1970 BC
AA-9874a	3580±50	horse 1 bone		2030–1780 BC
AA-9875b	3525±50	horse 2 bone		1920–1750 BC
<b>Kammeny Ambar 5 (S)</b>				
OxA-12532	3604±31	k2: grave 12, human bone		2020–1890 BCE
OxA-12530	3572±29	k2: grave 6, “	K	1950–1830 BCE
OxA-12533	3555±31	k2: grave 15, “		1950–1780 BCE
OxA-12531	3549±49	k2: grave 8, “	C, K	1950–1770 BCE
OxA-12534	3529±31	k4: grave 3, “		1920–1770 BCE
OxA-12560	3521±28	k4: grave 1, “		1890–1770 BCE
OxA-12535	3498±35	k4: grave 15, “		1880–1740 BCE
<b>Utyevka cemetery VI (P)</b>				
AA-12568	3760±100	k6: grave 4, human bone	K	2340–1980 BC
OxA-4264	3585±80	k6: grave 6, human bone		2110–1770 BC
OxA-4306	3510±80	k6: grave 4, human bone	K	1940–1690 BC
OxA-4263	3470±80	k6: grave 6, human bone	K	1890–1680 BC
<b>Potapovka cemetery I (P)</b>				
AA-12569	4180±85	k5: grave 6, dog bone*		2890–2620 BC

TABLE 15.1 (*continued*)

<i>Lab Number</i>	<i>BP Date</i>	<i>Sample Source</i>	<i>C, K</i>	<i>Calibrated Date</i>
AA-47803	4153±59	k.3: grave 1, human bone*		2880–2620 BC
OxA-4265	3710±80	k5: grave 13, human bone		2270–1960 BC
OxA-4266	3510±80	k5: grave 3, human bone		1940–1690 BC
AA-47802	3536±57	k.3: grave 1, horse skull*		1950–1770 BC
Other Potapovka cemeteries (P)				
AA-53803	4081±54	Kutuluk I, k1:1, human bone		2860–2490 BC
AA-53806	3752±52	Grachevka II k5:3, human bone		2280–2030 BC

\* See note 17

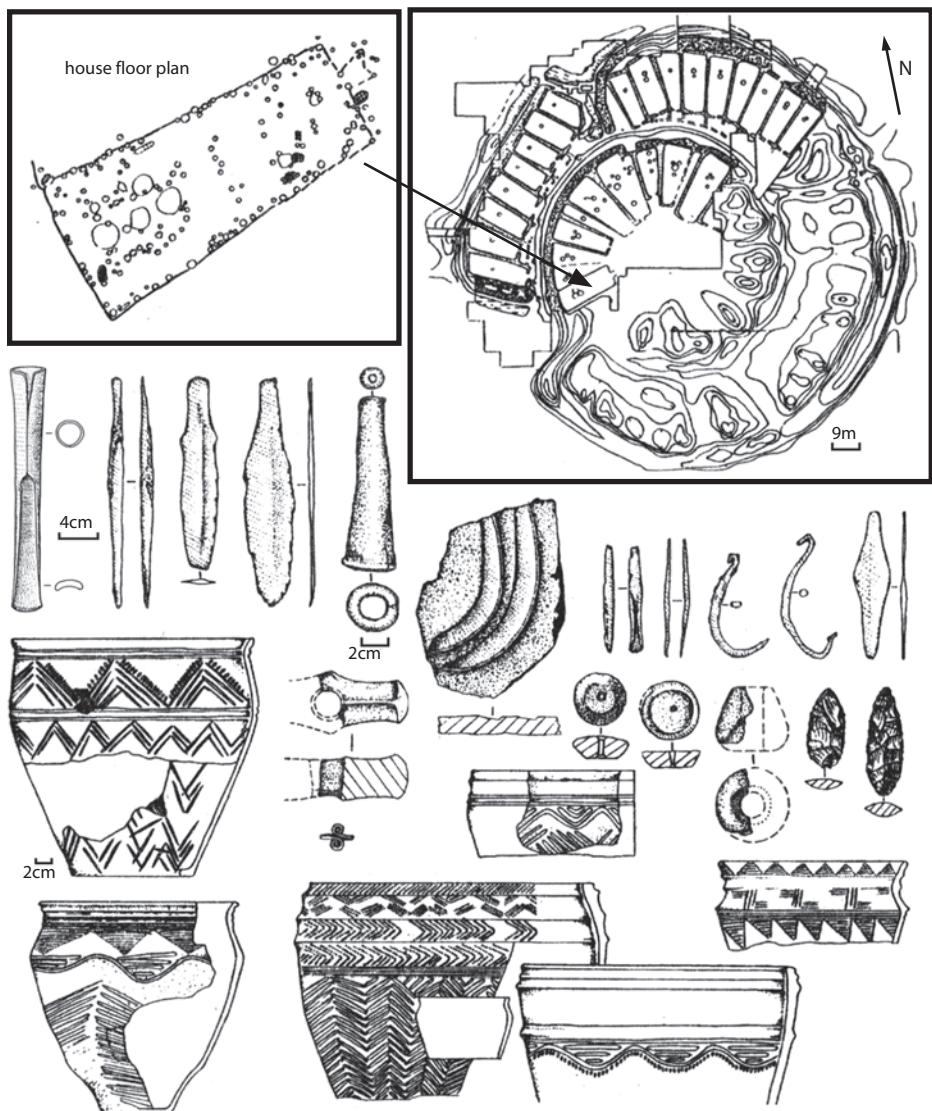
Graves that contained chariots are marked C; graves that contained studded disc cheekpieces are marked K.

steppes, late Yamnaya and a few late Usatovo groups continued to erect kurgan cemeteries. Some late Yamnaya groups penetrated northward into the forest-steppe, up the Dniester, South Bug, and Dnieper valleys. Eastern Carpathian groups making Globular Amphorae pottery moved from the upper Dniester region around Lvov eastward into the forest-steppe around Kiev, and then retreated back to the Dniester. Corded Ware groups from southern Poland replaced them around Kiev. Under the influence of this combined Globular Amphorae and Corded Ware expansion to the east, the already complex mixture of Yamnaya-influenced Late Tripolye people in the Middle Dnieper valley created the Middle Dnieper culture in the forest-steppe region around Kiev. This was the first food-producing, herding culture to push into the Russian forests north of Kiev.<sup>4</sup>

### *The Middle Dnieper and Fatyanovo Cultures*

The people of the Middle Dnieper culture carried stockbreeding economies (cattle, sheep, and pigs, depending on the region) north into the forest zone, up the Dnieper and Desna into what is now Belarus (figure 15.5). They followed marshes, open lakes, and riverine floodplains where there were natural openings in the forest. These open places had grass and reeds for the animals, and the rivers supplied plentiful fish. The earliest Middle Dnieper sites are dated about 2800–2600 BCE; the latest ones continued to about 1900–1800 BCE.<sup>5</sup> Early Middle Dnieper pottery showed clear similarities with Carpathian and eastern Polish Corded

## Arkaim settlement and finds



*Figure 15.4* Arkaim settlement, house plan, and artifacts, including a mold for casting curved sickle or knife blades. After Zdanovich 1995, figure 6.



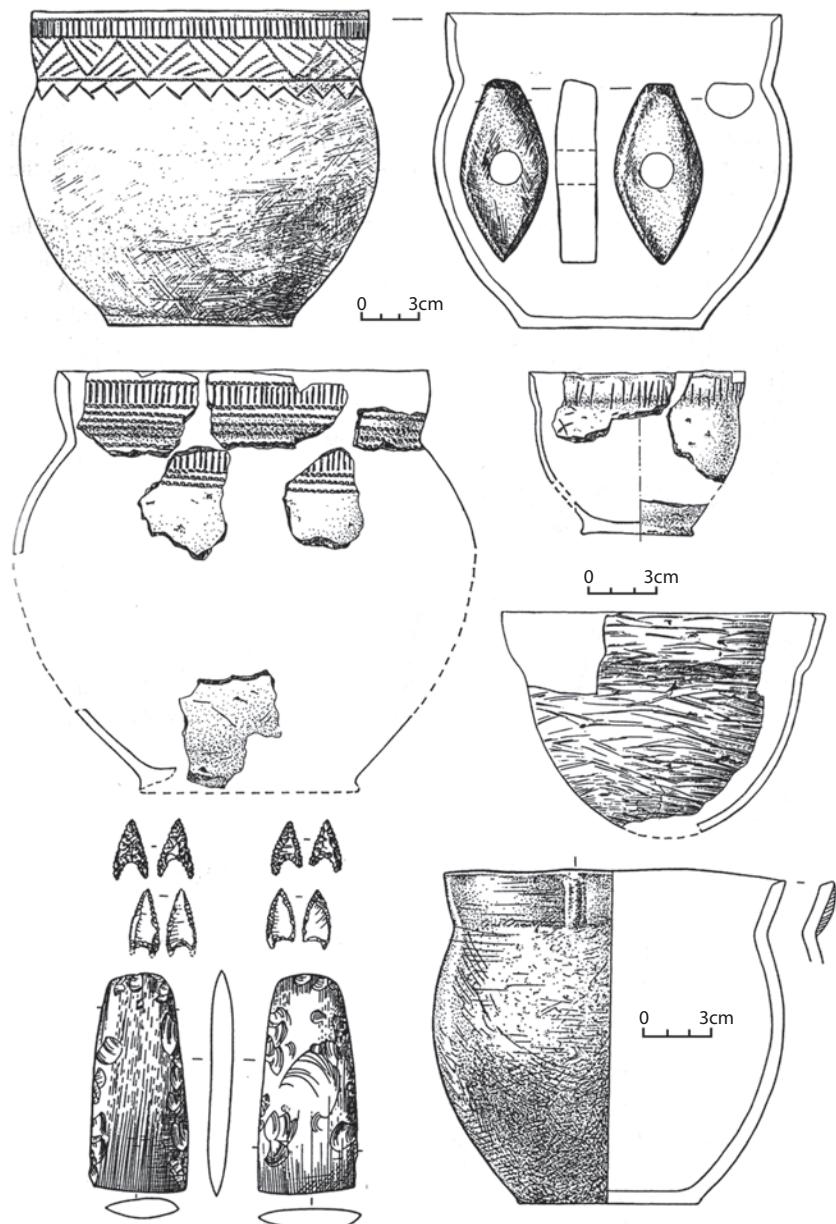
Figure 15.5 Culture groups of the Middle Bronze Age, 2800–2200 BCE.

Ware pottery, and Middle Dnieper pots have been found in Corded Ware graves near Grzeda Sokalska between the upper Dniester and the upper Vistula.<sup>6</sup> Some late Sredni Stog or Yamnaya elements also appeared in Middle Dnieper ceramics (figure 15.6). Middle Dnieper cemeteries contained both kurgans and flat-graves, both inhumation burials and cremations, with hollow-based flint arrowheads like those of the Yamnaya and Catacomb cultures, large trapezoidal flint axes like Globular Amphorae, and drilled stone “battle-axes” like those of the Corded Ware cultures. The Middle Dnieper culture clearly emerged from a series of encounters and exchanges between steppe and forest-steppe groups around Kiev, near the strategic fords over the Dnieper.<sup>7</sup>

A second culture, Fatyanovo, emerged at the northeastern edge of the Middle Dnieper culture. After the cattle herders moved out of the south-flowing Dnieper drainage and into the north-flowing rivers such as the Oka that coursed through the pine-oak-birch forests to the Upper Volga, they began to make pottery in distinctive Fatyanovo forms. But Fatyanovo pottery still showed mixed Corded Ware/Globular Amphorae traits, and the Fatyanovo culture probably was derived from an early variant of the Middle Dnieper culture. Ultimately Fatyanovo-type pottery, graves, and the cattle-raising economy spread over almost the entire Upper Volga basin. In the enormous western part of the Fatyanovo territory, from the Dvina to the Oka, very few Fatyanovo settlements are known, but more than three hundred large Fatyanovo flat-grave cemeteries, without kurgans, have been found on hills overlooking rivers or marshes. The Late Eneolithic Volosovo culture of the indigenous forest foragers was quite different in its pottery, economy, and mortuary customs. It disappeared when the Fatyanovo pioneers pushed into the Upper and Middle Volga basin.

The Middle Dnieper and Fatyanovo migrations overlapped the region where river and lake names in Baltic dialects, related to Latvian and Lithuanian, have been mapped by linguists: through the upper and middle Dnieper basin and the upper Volga as far east as the Oka. These names indicate the former extent of Baltic-speaking populations, which once occupied an area much larger than the area they occupy today. The Middle Dnieper and Fatyanovo migrations probably established the populations that spoke pre-Baltic dialects in the Upper Volga basin. Pre-Slavic probably developed between the middle Dnieper and upper Dniester among the populations that stayed behind.<sup>8</sup>

As Fatyanovo groups spread eastward down the Volga they discovered the copper ores of the western Ural foothills, and in this region, around the lower Kama River, they created long-term settlements. The Volga-Kama region,



*Figure 15.6* Ceramics and stone tools of the Middle Dnieper culture from sites in Belarus. After Kryvaltsevich and Kovalyukh 1999, figures 2 and 3.

which became the metallurgical heartland for almost all Fatyanovo metallurgy, has been separated from the rest of Fatyanovo and designated the Balanovo culture. Balanovo seems to be the settled, metal-working aspect of eastern Fatyanovo. At the southern fringe of Balanovo territory, in the forest-steppe zone of the middle Volga and upper Don where the rivers again flowed south, a fourth group emerged (after Middle Dnieper, Fatyanovo, and Balanovo). This was Abashevo, the easternmost of the Russian forest-zone cultures that were descended from Corded Ware ceramic traditions. The Abashevo culture played an important role in the origin of Sintashta.

### *The Abashevo Culture*

Abashevo probably began about 2500 BCE or a little later. A late Abashevo kurgan at Pepkino on the middle Volga is dated 2400–2200 BCE ( $3850 \pm 95$ , Ki-7665); I would guess that the grave actually was created closer to 2200 BCE. Late Abashevo traditions persisted west of the Urals probably as late as 1900 BCE, definitely into the Sintashta period, since late Abashevo vessels are found in Sintashta and Potapovka graves. Early Abashevo ceramic styles strongly influenced Sintashta ceramics.

Abashevo sites are found predominantly in the forest-steppe zone, although a few extended into the northern steppes of the middle Volga. Within the forest-steppe, they are distributed between the upper Don on the west, a region with many Abashevo settlements (e.g., Kondrashovka); the middle Volga region in the center, represented largely by kurgan cemeteries (including the type-site, the Abashevo kurgan cemetery); and up the Belya River into the copper-rich southwestern foothills of the Urals on the east, again with many settlements (like Balanbash, with plentiful evidence of copper smelting). More than two hundred Abashevo settlements are recorded; only two were clearly fortified, and many seem to have been occupied briefly. The easternmost Abashevo sites wrapped around the southern slopes of the Urals and extended into the Upper Ural basin, and it is these sites in particular that played a role in the origins of Sintashta.<sup>9</sup>

Some of the Volosovo foragers who had occupied these regions before 2500 BCE were absorbed into the Abashevo population, and others moved north. At the northern border of Abashevo territory, cord-impressed Abashevo and comb-stamped Volosovo ceramics are occasionally found inside the same structures at sites such as Bolshaya Gora.<sup>10</sup> Contact between late Volosovo and Abashevo populations west of the Urals probably helped to spread cattle-breeding economies and metallurgy into transitional northern forest cultures such as Chirkovska.

Whereas early Abashevo pottery looked somewhat like Fatyanovo/Balanovo Corded Ware, early Abashevo graves were covered by kurgans, unlike Fatyanovo flat cemeteries. Abashevo kurgans were surrounded by a circular ditch, the grave pit had ledges at the edges, and the body position was either contracted on the side or supine with raised knees—funeral customs derived from the Poltavka culture on the Volga. Abashevo ceramics also showed increasing decorative influences from steppe Catacomb-culture ceramic traditions, in both motifs (horizontal line-and-dot, horizontal fluting) and technology (shell tempering). Some Abashevo metal types such as waisted knives copied Catacomb and Poltavka types. A. D. Pryakhin, the preeminent expert on the Abashevo culture, concluded that it originated from contacts between Fatyanovo/Balanovo and Catacomb/Poltavka populations in the southern forest-steppe. In many ways, the Abashevo culture was a conduit through which steppe customs spread northward into the forest-steppe. Most Russian archaeologists interpret the Abashevo culture as a border culture associated with Indo-Iranian speakers, unlike Fatyanovo.<sup>11</sup>

Abashevo settlements in the Belaya River valley such as Balanbash contained crucibles, slag, and casting waste. Cast shaft-hole axes, knives, socketed spears, and socketed chisels were made by Abashevo metalsmiths. About half of all analyzed Abashevo metal objects were made of pure copper from southwestern Ural sandstone ores (particularly ornaments), and about half were arsenical bronze thought to have been made from southeastern Ural quartzitic ores (particularly tools and weapons), the same ores later exploited by Sintashta miners. High-status Abashevo graves contained copper and silver ornaments, semicircular solid copper and silver bracelets, cast shaft-hole axes, and waisted knives (figure 15.7). High-status Abashevo women wore distinctive headbands decorated with rows of flat and tubular beads interspersed with suspended double-spiral and cast rosette pendants, made of copper and silver. These headbands were unique to the Abashevo culture and probably were signals of ethnic as well as political status.<sup>12</sup>

The clear signaling of identity seen in Abashevo womens' headbands occurred in a context of intense warfare—not just raiding but actual warfare. At the cemetery of Pepkino, near the northern limit of Abashevo territory on the lower Sura River, a single grave pit 11 m long contained the bodies of twenty-eight young men, eighteen of them decapitated, others with axe wounds to the head, axe wounds on the arms, and dismembered extremities. This mass grave, probably dated about 2200 BCE, also contained Abashevo pottery, a two-part mold for making a shaft-hole axe

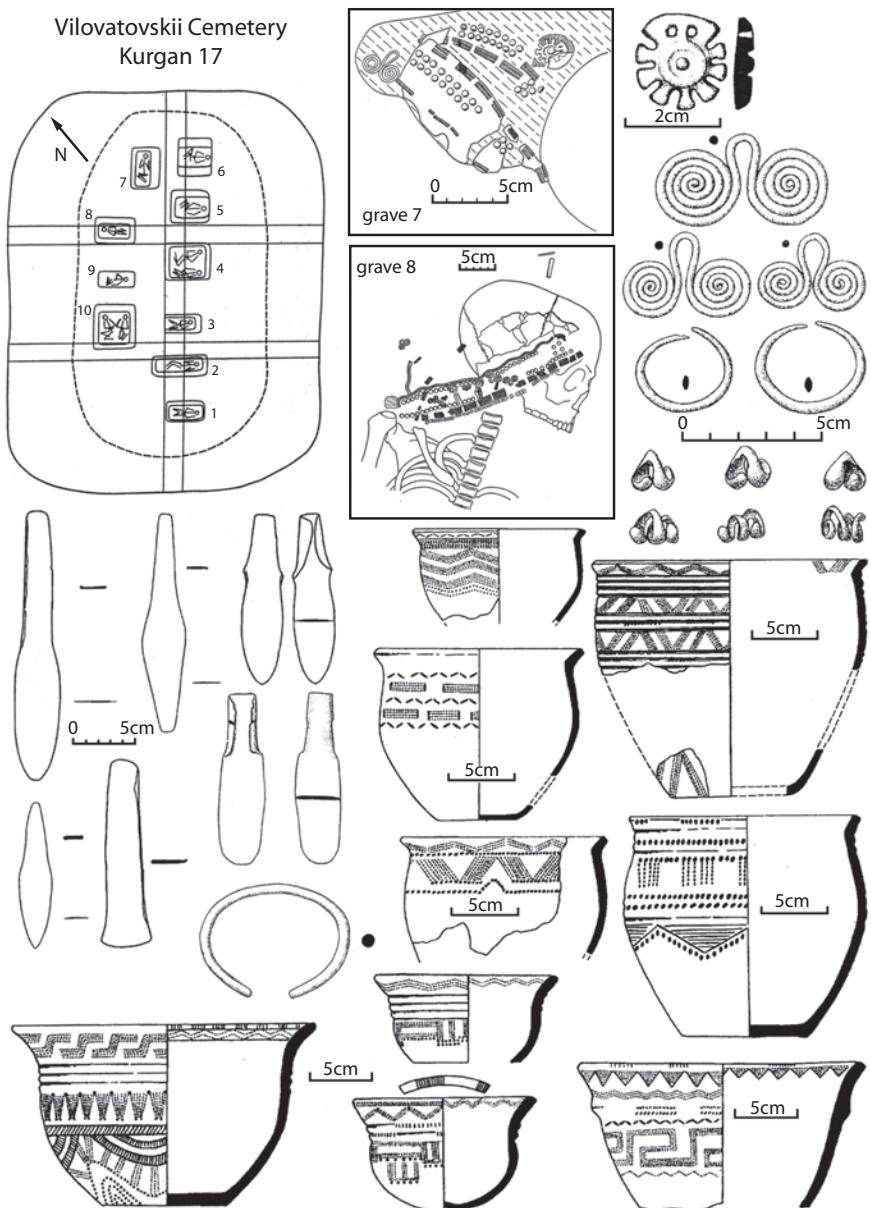


Figure 15.7 Abashevo culture graves and metal objects from the middle Volga forest-steppe (upper left), including distinctive cast copper rosettes; and ceramics from the south Ural region (lower right). After O. V. Kuzmina 1999, figures 23 and 24 (ceramics); and Bol'shov 1995, figure 13 (grave goods).

of Chernykh's Type V, and a crucible. It was covered by a single kurgan and so probably reflected a single event, clearly a serious battle or massacre. The absence of women or children in the grave indicates that it was not a settlement massacre. If it was the result of a battle, it implies a force of 280 to 560 on the Abashevo side alone, because deaths in tribal battles rarely reached 10% of the fighting force and usually were more like 5%.<sup>13</sup> Forces this size would require a considerable degree of inter-regional political integration. Intense warfare, perhaps on a surprising scale, was part of the political landscape during the late Abashevo era. In this context, the fortifications around Sintashta settlements and the invention of new fighting technologies—including the chariot—begin to make sense.

Linguists have identified loans that were adopted into the early Finno-Ugric (F-U) languages from Pre-Indo-Iranian and Proto-Indo-Iranian (Proto-I-I). Archaeological evidence for Volosovo-Abashevo contacts around the southern Urals probably were the medium through which these loans occurred. Early Proto-Indo-Iranian words that were borrowed into common Finno-Ugric included Proto-I-I *\*asura-* ‘lord, god’ > F-U *\*asera*; Proto-I-I *\*medʰu-* ‘honey’ > F-U *\*mete*; Proto-I-I *\*čekro-* ‘wheel’ > F-U *\*kekrä*; and Proto-I-I *\*arya-* ‘Aryan’ > F-U *\*orya*. Proto-Indo-Iranian *\*arya-*, the self designation “Aryan,” was borrowed into Pre-Saami as *\*orja-*, the root of *\*oarji*, meaning “southwest,” and of *ärjel*, meaning “southerner,” confirming that the Proto-Aryan world lay south of the early Uralic region. The same borrowed *\*arya-* root developed into words with the meaning “slave” in the Finnish and Permic branches (Finnish, Komi, and Udmurt), a hint of ancient hostility between the speakers of Proto-Indo-Iranian and Finno-Ugric.<sup>14</sup>

#### PRE-SINTASHTA CULTURES OF THE EASTERN STEPPE

Who lived in the Ural-Tobol steppes during the late Abashevo era, before the Sintashta strongholds appeared there? There are two local antecedents and several unrelated neighbors.

#### *Sintashta Antecedents*

Just to the north of the steppe zone later occupied by Sintashta settlements, the southern forest-steppe zone contained scattered settlements of the late Abashevo culture. Abashevo miners regularly worked the quartzitic arsenic-rich copper ores of the Ural-Tobol region. Small settlements of the Ural variant of late Abashevo appeared in the upper Ural River valley

and perhaps as far east as the upper Tobol. Geometric meanders first became a significant new decorative motif on Abashevo pottery made in the Ural region [see figure 15.7], and the geometric meander remained popular in Sintashta motifs. Some early Sintashta graves contained late Abashevo pots, and some late Abashevo sites west of the Urals contained Sintashta-type metal weapons and chariot gear such as disc-shaped cheekpieces that might have originated in the Sintashta culture. But Ural Abashevo people did not conduct mortuary animal sacrifices on a large scale, many of their metal types and ornaments were different, and, even though a few of their settlements were surrounded by small ditches, this was unusual. They were not fortified like the Sintashta settlements in the steppes.

Poltavka-culture herders had earlier occupied the northern steppe zone just where Sintashta appeared. The Poltavka culture was essentially a Volga-Ural continuation of the early Yamnaya horizon. Poltavka herding groups moved east into the Ural-Tobol steppes probably between 2800 and 2600 BCE. Poltavka decorative motifs on ceramics (vertical columns of chevrons) were very common on Sintashta pottery. A Poltavka kurgan cemetery (undated) stood on a low ridge 400 m south of the future site of Arkaim before that fortified settlement was built near the marshy bottom of the valley.<sup>15</sup> The cemetery, Aleksandrovska IV, contained twenty-one small (10–20 m in diameter) kurgans, a relatively large Poltavka cemetery (figure 15.8). Six were excavated. All conformed to the typical Poltavka rite: a kurgan surrounded by a circular ditch, with a single grave with ledges, the body tightly contracted on the left or right side, lying on an organic mat, red ochre or white chalk by the head and occasionally around the whole body, with a pot or a flint tool or nothing. A few animal bones occasionally were dropped in the perimeter ditch. A Poltavka settlement was stratified beneath the Sintashta settlement of Kuisak, which is intriguing because Poltavka settlements, like Yamnaya settlements, are generally unknown. Unfortunately this one was badly disturbed by the Sintashta settlement that was built on top of it.<sup>16</sup>

In the middle Volga region, the Potapovka culture was a contemporary sister of Sintashta, with similar graves, metal types, weapons, horse sacrifices, and chariot-driving gear (bone cheekpieces and whip handles), dated by radiocarbon to the same period, 2100–1800 BCE. Potapovka pottery, like Sintashta, retained many Poltavka decorative traits, and Potapovka graves were occasionally situated directly on top of older Poltavka monuments. Some Potapovka graves were dug right through preexisting Poltavka graves, destroying them, as some Sintashta strongholds were built on top of and incorporated older Poltavka settlements.<sup>17</sup> It is difficult to

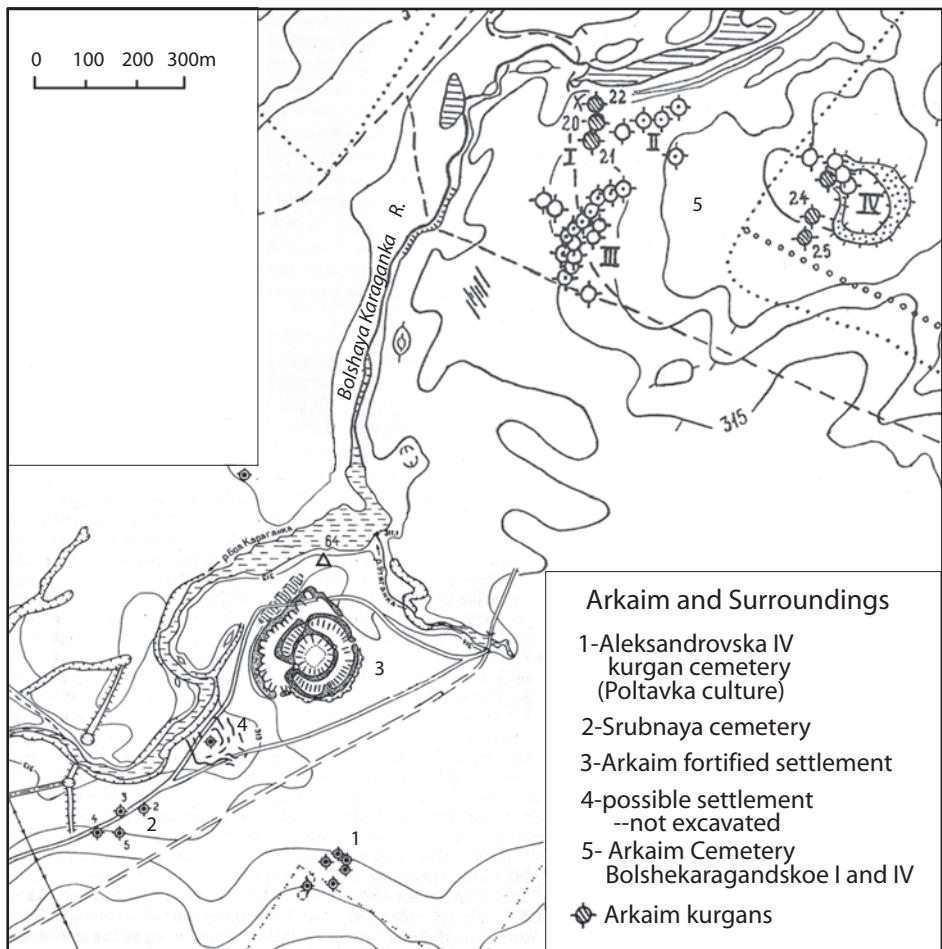


Figure 15.8 Arkaim settlement landscape with the kurgan cemeteries of Aleksandrovka IV (1), an older Poltavka cemetery of six kurgans; and Bolshekarakandskoe I and IV (5), with two excavated Sintashta-culture kurgans (24 and 25). Composite of Zdanovich 2002, Figure 3; and Batanina and Ivanova 1995, figure 2.

imagine that this was accidental. A symbolic connection with old Poltavka clans must have guided these choices.

Poltavka herders might have begun to explore across the vast Kazakh plains toward Sarazm, an outpost of Central Asian urban civilization established before 3000 BCE near modern Samarkand in the Zeravshan valley (see figure 16.1). Its northern location placed it just

beyond the range of steppe herders who pushed east of the Urals around 2500 BCE.<sup>18</sup>

### *Hunters and Traders in Central Asia and the Forest Zone*

Between the Poltavka territory in the upper Tobol steppes and Sarazm in the Zeravshan Valley lived at least two distinct groups of foragers. In the south, around the southern, western, and eastern margins of the Aral Sea, was the Kelteminar culture, a culture of relatively sedentary hunters and gatherers who built large reed-covered houses near the marshes and lakes in the steppes and in the riverbank thickets (called *tugai* forest) of the Amu Darya (Oxus) and lower Zeravshan rivers, where huge Siberian tigers still prowled. Kelteminar hunters pursued bison and wild pigs in the *tugai*, and gazelle, onagers, and Bactrian camels in the steppes and deserts. No wild horses ranged south of the Kyzl Kum desert, so Kelteminar hunters never saw horses, but they caught lots of fish, and collected wild pomegranates and apricots. They made a distinctive incised and stamped pottery. Early Kelteminar sites such as Dingil'dzhe 6 had microlithic flint industries much like those of Dzhebel Cave layer IV, dated about 5000 BCE. Kelteminar foragers probably began making pottery about this time, toward the end of the sixth millennium BCE. Late Kelteminar lasted until around 2000 BCE. Kelteminar pottery was found at Sarazm (level II), but the Kyzl Kum desert, north of the Amu Darya River, seems to have been an effective barrier to north-south communication with the northern steppes. Turquoise, which outcropped on the lower Zeravshan and in the desert southeast of the Aral Sea, was traded southward across Iran but not into the northern steppes. Turquoise ornaments appeared at Sarazm, at many early cities on the Iranian plateau, and even in the Mai-kop chieftain's grave (chapter 12), but not among the residents of the northern steppes.<sup>19</sup>

A second and quite different network of foragers lived in the northern steppes, north of the Aral Sea and the Syr Darya river (the ancient Jaxartes). Here the desert faded into the steppes of central and northern Kazakhstan, where the biggest predators were wolves and the largest grazing mammals were wild horses and saiga antelope (both absent in the Kelteminar region). In the lusher northern steppes, the descendants of the late Botai-Tersek culture still rode horses, hunted, and fished, but some of them now kept a few domesticated cattle and sheep and also worked metal. The post-Botai settlement of Sergeivka on the middle Ishim River is dated by radiocarbon about 2800–2600 BCE ( $4160 \pm 80$

BP, OxA-4439). It contained pottery similar to late Botai-Tersek pottery, stone tools typical for late Botai-Tersek, and about 390 bones of horses (87%) but also 60 bones of cattle and sheep (13%), a new element in the economy of this region. Fireplaces, slag, and copper ore also were found. Very few sites like Sergeivka have been recognized in northern Kazakhstan. But Sergeivka shows that by 2800–2600 BCE an indigenous metallurgy and a little herding had begun in northern Kazakhstan. The impetus for these innovations probably was the arrival of Poltavka herders in the Tobol steppes. Pottery similar to that at Sergeivka was found in the Poltavka graves at Aleksandrovska IV, confirming contact between the two.<sup>20</sup>

North of the Ural-Tobol steppes, the foragers who occupied the forested eastern slopes of the Ural Mountains had little effect on the early Sintashta culture. Their natural environment was rich enough to permit them to live in relatively long-term settlements on river banks while still depending just on hunting and fishing. They had no formal cemeteries. Their pottery had complex comb-stamped geometric motifs all over the exterior surface. Ceramic decorations and shapes were somewhat similar between the forest-zone Ayatskii and Lipchinskii cultures on one side and the steppe zone Botai-Tersek cultures on the other. But in most material ways the forest-zone cultures remained distinct from Poltavka and Abashevo, until the appearance of the Sintashta culture, when this relationship changed. Forest-zone cultures adopted many Sintashta customs after about 2200–2100 BCE. Crucibles, slag, and copper rods interpreted as ingots appeared at Tashkovo II and Iska III, forager settlements located on the Tobol River north of Sintashta. The animal bones from these settlements were still from wild game—elk, bear, and fish. Some Tashkovo II ceramics displayed geometric meander designs borrowed from late Abashevo or Sintashta. And the houses at Tashkovo II and Andreevskoe Ozero XIII were built in a circle around an open central plaza, as at Sintashta or Arkaim, a settlement plan atypical of the forest zone.

#### THE ORIGIN OF THE SINTASHTA CULTURE

A cooler, more arid climate affected the Eurasian steppes after about 2500 BCE, reaching a peak of aridity around 2000 BCE. Ancient pollen grains cored from bogs and lake floors across the Eurasian continent show the effects this event had on wetland plant communities.<sup>21</sup> Forests retreated, open grassland expanded, and marshes dwindled. The steppes southeast of the Ural Mountains, already drier and colder than the Middle Volga grasslands southwest of the Urals, became drier still. Around 2100 BCE a

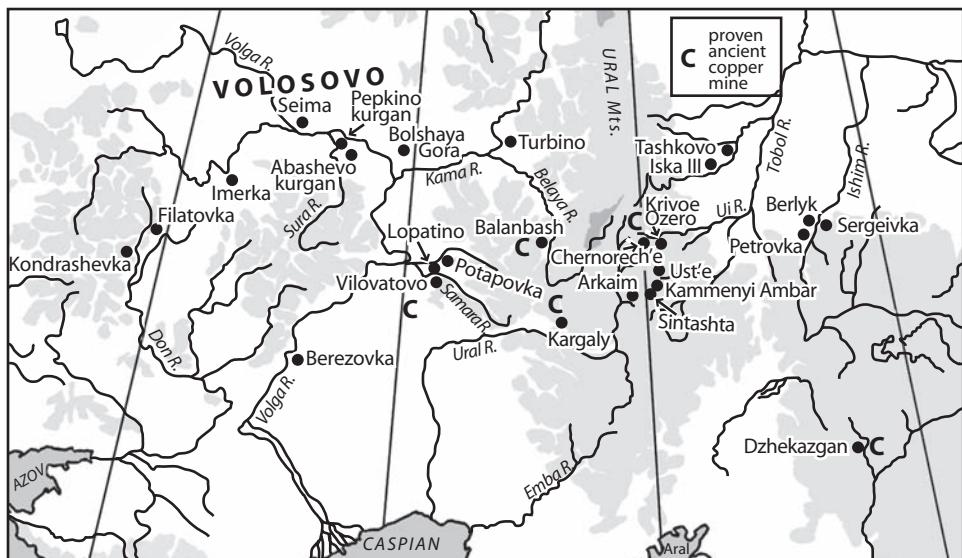


Figure 15.9 Sites of the period 2100–1800 BCE in the northern steppe and southern forest-steppe between the Don and the Ishim, with the locations of proven Bronze Age copper mines. The Sintashta-Potapovka-Filatovka complex probably is the archaeological manifestation of the Indo-Iranian language group.

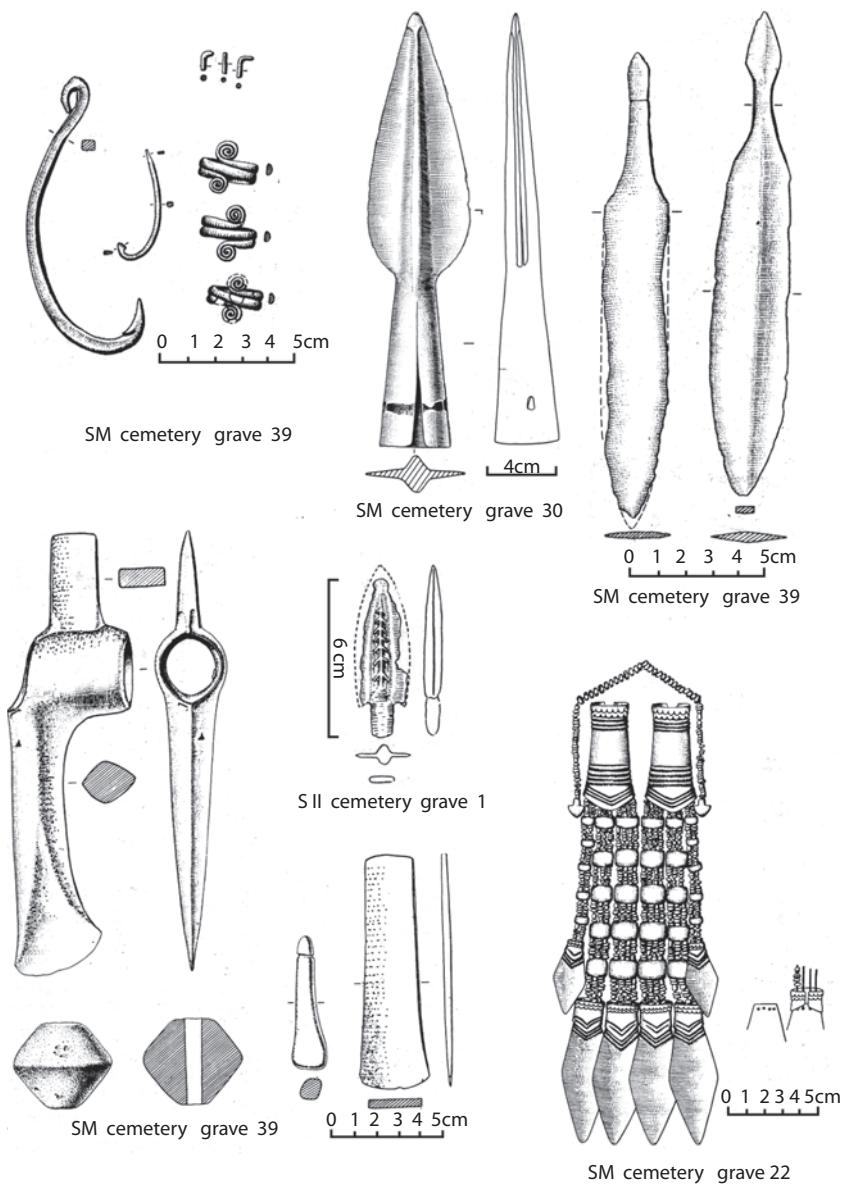
mixed population of Poltavka and Abashevo herders began to settle in fortified strongholds between the upper Tobol and Ural River valleys, near the shrinking marshes that were vital for wintering their herds (see figure 15.9). Eurasian steppe pastoralists have generally favored marshy regions as winter refuges because of the winter forage and protection offered by stands of *Phragmites* reeds up to three meters tall. In a study of mobility among Late Mesolithic foragers in the Near East, Michael Rosenberg found that mobile populations tended to settle near critical resources when threatened with increased competition and declining productivity. He compared the process to a game of musical chairs,<sup>22</sup> in which the risk of losing a critical resource, in this case, winter marshlands for the cattle, was the impetus for settling down. Most Sintashta settlements were built on the first terrace overlooking the floodplain of a marshy, meandering stream. Although heavily fortified, these settlements were put in marshy, low places rather than on more easily defended hills nearby (see figures 15.2 and 15.8).

More than twenty Sintashta-type walled settlements were erected in the Ural-Tobol steppes between about 2100 and 1800 BCE. Their impressive

fortifications indicate that concentrating people and herds near a critical wintering place was not sufficient in itself to protect it. Walls and towers also were required. Raiding must have been endemic. Intensified fighting encouraged tactical innovations, most important the invention of the light war chariot. This escalation of conflict and competition between rival tribal groups in the northern steppes was accompanied by elaborate ceremonies and feasts at funerals conducted within sight of the walls. Competition between rival hosts led to potlatch-type excesses such as the sacrifice of chariots and whole horses.

The geographic position of Sintashta societies at the eastern border of the Pontic-Caspian steppe world exposed them to many new cultures, from foragers to urban civilizations. Contact with the latter probably was most responsible for the escalation in metal production, funeral sacrifices, and warfare that characterized the Sintashta culture. The brick-walled towns of the Bactria-Margiana Archaeological Complex (BMAC) in Central Asia connected the metal miners of the northern steppes with an almost bottomless market for copper. One text from the city of Ur in present-day Iraq, dated to the reign of Rim-Sin of Larsa (1822–1763 BCE), recorded the receipt of 18,333 kg (40,417 lb, or 20 tons) of copper in a single shipment, most of it earmarked for only one merchant.<sup>23</sup> This old and well-oiled Asian trade network was connected to the northern Eurasian steppes for the first time around 2100–2000 BCE (see chapter 16 for the contact between Sintashta and BMAC sites).

The unprecedented increase in demand for metal is documented most clearly on the floors of Sintashta houses. Sintashta settlements were industrial centers that specialized in metal production. Every excavated structure at Sintashta, Arkaim, and Ust'e contained the remains of smelting ovens and slag from processing copper ore. The metal in the majority of finished objects was arsenical bronze, usually in alloys of 1–2.5% arsenic; tin-bronzes comprised only 2% or less of metal objects. At Sintashta, 36% of tested objects were made of copper with elevated arsenic (from 0.1–1% arsenic), and 48% were classified as arsenical bronze (over 1% arsenic). Unalloyed copper objects were more frequent at Arkaim, where they constituted almost half the tested objects, than at Sintashta, where they made up only 10% of tested objects. Clay tubular pipes probably for the mouths of the bellows, or *tulieres*, occurred in graves and settlements (see figure 15.4). Pieces of crucibles were found in graves at Krivoe Ozero. Closed two-piece molds were required to cast bronze shaft-hole axes and spear blades (see figure 15.10). Open single-piece molds for casting curved sickles and rod-like copper ingots were found in the Arkaim settlement.



*Figure 15.10* Weapons, tools, and ornaments from graves at Sintashta. After Gening, Zdanovich, and Gening 1992, figures 99, 113, 126, and 127.

Ingots or rods of metal weighing 50–130g might have been produced for export. An estimated six thousand tons of quartzitic rock bearing 2–3% copper was mined from the single excavated mining site of Vorovskaya Yama east of the upper Ural River.<sup>24</sup>

Warfare, a powerful stimulus to social and political change, also shaped the Sintashta culture, for a heightened threat of conflict dissolves the old social order and creates new opportunities for the acquisition of power. Nicola DiCosmo has recently argued that complex political structures arose among steppe nomads in the Iron Age largely because intensified warfare led to the establishment of permanent bodyguards around rival chiefs, and these grew in size until they became armies, which engendered state-like institutions designed to organize, feed, reward, and control them. Susan Vehik studied political change in the deserts and grasslands of the North American Southwest after 1200 CE, during a period of increased aridity and climatic volatility comparable to the early Sintashta era in the steppes. Warfare increased sharply during this climatic downturn in the Southwest. Vehik found that long-distance trade increased greatly at the same time; trade after 1350 CE was more than forty times greater than it had been before then. To succeed in war, chiefs needed wealth to fund alliance-building ceremonies before the conflict and to reward allies afterward. Similarly, during the climatic crisis of the late MBA in the steppes, competing steppe chiefs searching for new sources of prestige valuables probably discovered the merchants of Sarazm in the Zeravshan valley, the northernmost outpost of Central Asian civilization. Although the connection with Central Asia began as an extension of old competitions between tribal chiefs, it created a relationship that fundamentally altered warfare, metal production, and ritual competition among the steppe cultures.<sup>25</sup>

#### WARFARE IN THE SINTASHTA CULTURE: FORTIFICATIONS AND WEAPONS

A significant increase in the intensity of warfare in the southern Ural steppes is apparent from three factors: the regular appearance of large fortified towns; increased deposits of weapons in graves; and the development of new weapons and tactics. All the Sintashta settlements excavated to date, even relatively small ones like Chernorech'ye III, with perhaps six structures (see figure 15.11), and Ust'e, with fourteen to eighteen structures, were fortified with V-shaped ditches and timber-reinforced earthen walls.<sup>26</sup> Wooden palisade posts were preserved inside the earthen walls at

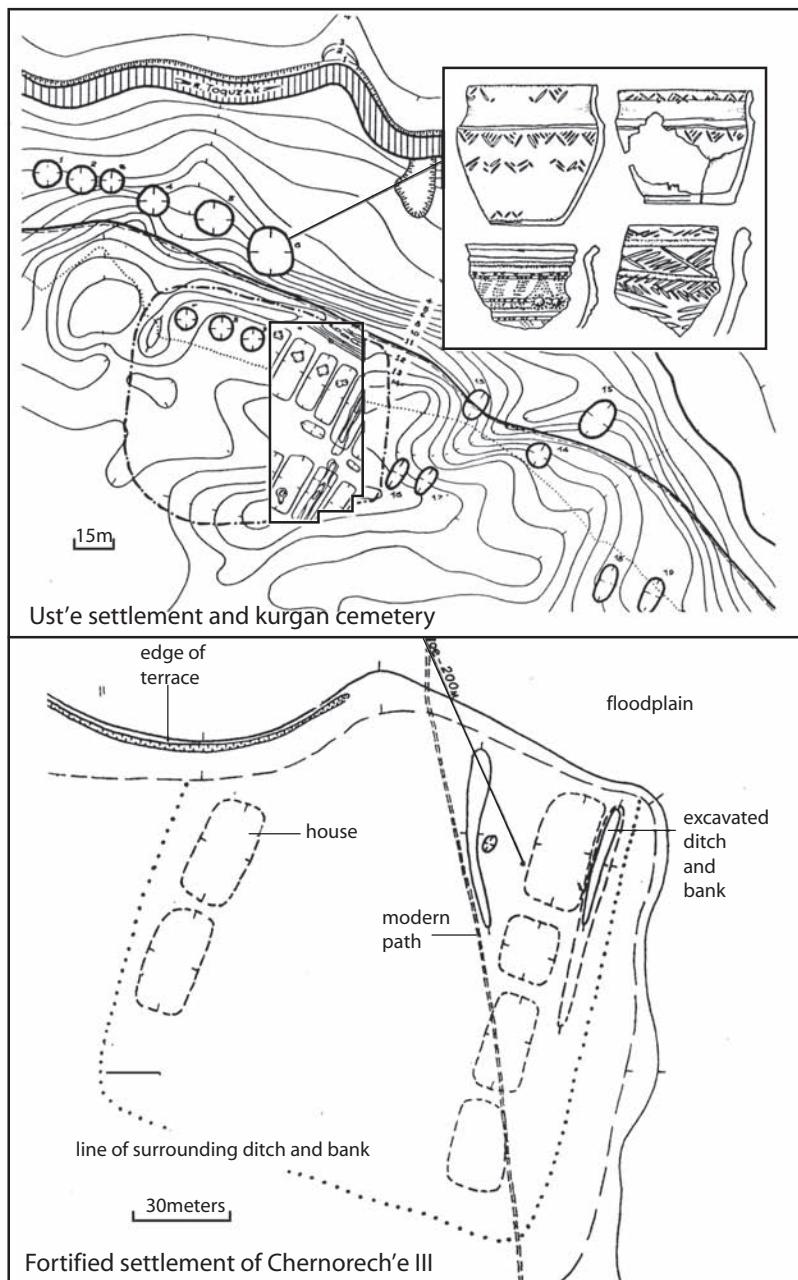


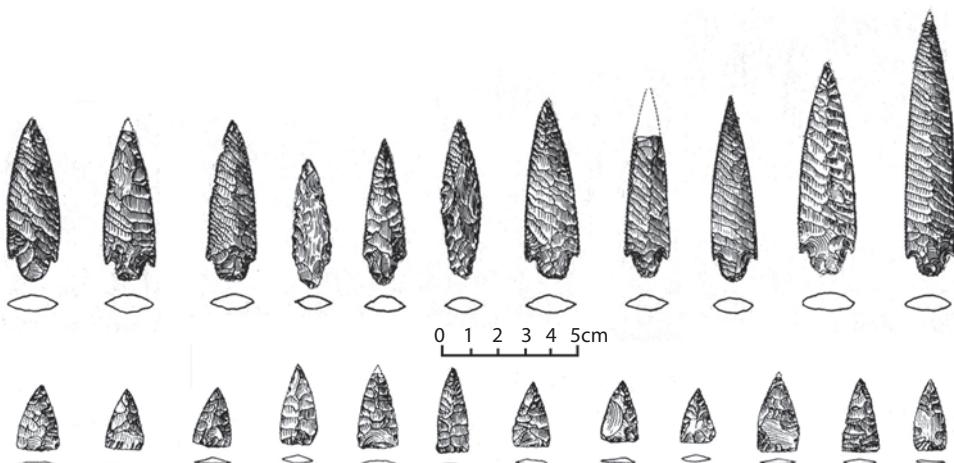
Figure 15.11 Smaller walled settlements of the Sintashta type at Ust'e and Chernorech'e III. After Vinogradov 2003, figure 3.

Ust'ye, Arkaim, and Sintashta. Communities build high walls and gates when they have reason to fear that their homes will come under attack.

The graves outside the walls now also contained many more weapons than in earlier times. The Russian archaeologist A. Epimakhov published a catalogue of excavated graves from five cemeteries of the Sintashta culture: Bol'shekarakaganskoe (the cemetery for the Arkaim citadel), Kammeny Ambar 5, Krivoe Ozero, Sintashta, and Solntse II.<sup>27</sup> The catalogue listed 242 individuals in 181 graves. Of these, 65 graves contained weapons. Only 79 of the 242 individuals were adults, but 43 of these, or 54% of all adults, were buried with weapons. Most of the adults in the weapon graves were not assigned a gender, but of the 13 that were, 11 were males. Most adult males of the Sintashta culture probably were buried with weapons. In graves of the Poltavka, Catacomb, or Abashevo cultures, weapons had been unusual. They were more frequent in Abashevo than in the steppe graves, but the great majority of Abashevo graves did not contain weapons of any kind, and, when they did, usually it was a single axe or a projectile point. My reading of reports on kurgan graves of the earlier EBA and MBA suggests to me that less than 10% contained weapons. The frequency of weapons in adult graves of the Sintashta culture (54%) was much higher.

New types of weapons also appeared. Most of the weapon types in Sintashta graves had appeared earlier—bronze or copper daggers, flat axes, shaft-hole axes, socketed spears, polished stone mace heads, and flint or bone projectile points. In Sintashta-culture graves, however, longer, heavier projectile point types appeared, and they were deposited in greater numbers. One new projectile was a spearhead made of heavy bronze or copper with a socketed base for a thick wooden spear handle. Smaller, lighter-socketed spearheads had been used occasionally in the Falyanovo culture, but the Sintashta spear was larger (see figure 15.3). Sintashta graves also contained two varieties of chipped flint projectile points: lanceolate and stemmed (see figure 15.12). Short lanceolate points with flat or slightly hollow bases became longer in the Sintashta period, and these were deposited in groups for the first time. They might have been for arrows, since prehistoric arrow points were light in weight and usually had flat or hollow bases. Lanceolate flint points with a hollow or flat base occurred in seven graves at Sintashta, with up to ten points in one grave (SM gr. 39). A set of five lanceolate points was deposited in the chariot grave of Berlyk II, kurgan 10.

More interesting were flint points of an entirely new type, with a contracting stem, defined shoulders, and a long, narrow blade with a thick medial ridge, 4–10 cm long. These new stemmed points might have been for javelins. Their narrow, thick blades were ideal for javelin points because the



*Figure 15.12* Flint projectile point types of the Sintashta culture. The top row was a new type for steppe cultures, possibly related to the introduction of the javelin. The bottom row was an old type in the steppes, although in older EBA and MBA graves it was more triangular. After Gening, Zdanovich, and Gening 1992.

heavier shaft of a javelin (compared to an arrow) causes greater torque stress on the embedded point at the moment of impact; moreover, a narrow, thick point could penetrate deeper before breaking than a thin point could.<sup>28</sup> A stemmed point, by definition, is mounted in a socketed foreshaft, a complex type of attachment usually found on spears or javelins rather than arrows. Smaller stemmed points had existed earlier in Fatyanovo and Balanovo tool kits and were included in occasional graves, as at the Fatyanovo cemetery of Volosovo-Danilovskii, where 1 grave out of 107 contained a stemmed point, but it was shorter than the Sintashta type (only 3–4 cm long). Sintashta stemmed points appeared in sets of up to twenty in a single grave (chariot gr. 20 at the Sintashta SM cemetery), as well as in a few Potapovka graves on the middle Volga. Stemmed points made of cast bronze, perhaps imitations of the flint stemmed ones, occurred in one chariot grave (SM gr. 16) and in two other graves at Sintashta (see figure 15.10).

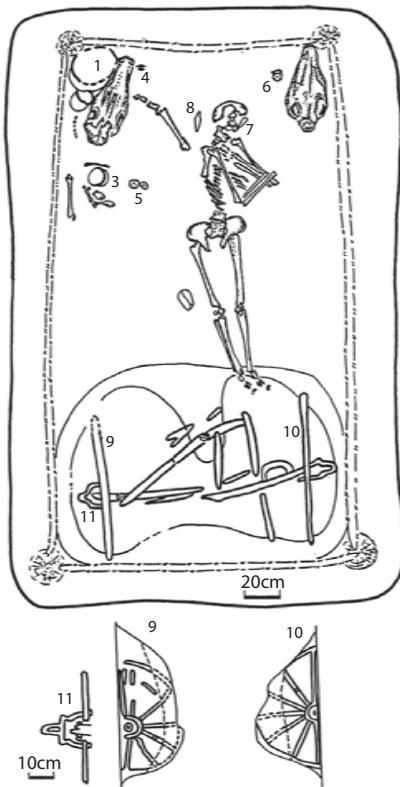
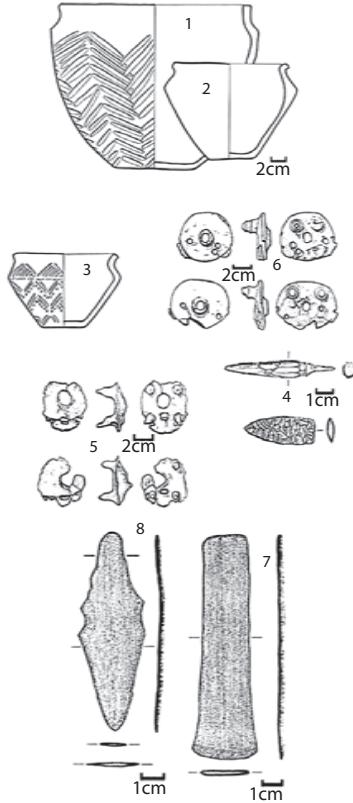
Weapons were deposited more frequently in Sintashta graves. New kinds of weapons appeared, among them long points probably intended for javelins, and they were deposited in sets that appear to represent warriors' equipment for battle. Another signal of increased conflict is the most hotly debated artifact of this period in the steppes—the light, horse-drawn chariot.

*Sintashta Chariots: Engines of War*

A chariot is a two-wheeled vehicle with spoked wheels and a standing driver, pulled by bitted horses, and usually driven at a gallop. A two-wheeler with solid wheels or a seated driver is a cart, not a chariot. Carts, like wagons, were work vehicles. Chariots were the first wheeled vehicles designed for speed, an innovation that changed land transport forever. The spoked wheel was the central element that made speed possible. The earliest spoked wheels were wonders of bent-wood joinery and fine carpentry. The rim had to be a perfect circle of joined wood, firmly attached to individually carved spokes inserted into mortices in the outer wheel and a multi-socketed central nave, all carved and planed out of wood with hand tools. The cars also were stripped down to just a few wooden struts. Later Egyptian chariots had wicker walls and a floor of leather straps for shock absorption, with only the frame made of wood. Perhaps originally designed for racing at funerals, the chariot quickly became a weapon and, in that capacity, changed history.

Today most authorities credit the invention of the chariot to Near Eastern societies around 1900–1800 BCE. Until recently, scholars believed that the chariots of the steppes post-dated those of the Near East. Carvings or petroglyphs showing chariots on rock outcrops in the mountains of eastern Kazakhstan and the Russian Altai were ascribed to the Late Bronze Age Andronovo horizon, thought to date after 1650 BCE. Disk-shaped cheekpieces made of antler or bone found in steppe graves were considered copies of older Mycenaean Greek cheekpieces designed for the bridles of chariot teams. Because the Mycenaean civilization began about 1650 BCE, the steppe cheekpieces also were assumed to date after 1650 BCE.<sup>29</sup>

The increasing amount of information about chariot graves in the steppes since about 1992 has challenged this orthodox view. The archaeological evidence of steppe chariots survives only in graves where the wheels were placed in slots that had been dug into the grave floors. The lower parts of the wheels left stains in the earth as they rotted (see figure 15.13). These stains show an outer circle of bent wood 1–1.2 m in diameter with ten to twelve square-sectioned spokes. There is disagreement as to the number of clearly identified chariot graves because the spoke imprints are faint, but even the conservative estimate yields sixteen chariot graves in nine cemeteries. All belonged to either the Sintashta culture in the Ural-Tobol steppes or the Petrovka culture east of Sintashta in northern Kazakhstan. Petrovka was contemporary with late Sintashta, perhaps 1900–1750 BC, and developed directly from it.<sup>30</sup>



Scholars disagree as to whether steppe chariots were effective instruments of war or merely symbolic vehicles designed only for parade or ritual use, made in barbaric imitation of superior Near Eastern originals.<sup>31</sup> This debate has focused, surprisingly, on the distance between the chariots' wheels. Near Eastern war chariots had crews of two or even three—a driver and an archer, and occasionally a shield-bearer to protect the other two from incoming missiles. The gauge or track width of Egyptian chariots of ca. 1400–1300 BCE, the oldest Near Eastern chariots preserved well enough to measure, was 1.54–1.80 m. The hub or nave of the wheel, a necessary part that stabilized the chariot, projected at least 20 cm along the axle on each side. A gauge around 1.4–1.5 m would seem the minimum to provide enough room between the wheels for the two inner hubs or naves (20 + 20 cm) and a car at least 1 m wide to carry two men. Sintashta and Petrovka-culture chariots with less than 1.4–1.5 m between their wheels were interpreted as parade or ritual vehicles unfit for war.

This dismissal of the functional utility of steppe chariots is unconvincing for six reasons. First, steppe chariots were made in many sizes, including two at Kammery Ambar 5, two at Sintashta (SM gr. 4, 28) and two at Berlyk (Petrovka culture) with a gauge between 1.4 and 1.6 m, big enough for a crew of two. The first examples published in English, which were from Sintashta (SM gr. 19) and Krivoe Ozero (k. 9, gr. 1), had gauges of only about 1.2–1.3 m, as did three other Sintashta chariots (SM gr. 5, 12, 30) and one other Krivoe Ozero chariot. The argument against the utility of steppe chariots focused on these six vehicles, most of which, in spite of their narrow gauges, were buried with weapons. However, six other steppe vehicles were as wide as some Egyptian war chariots. One (Sintashta SM gr. 28) with a gauge of about 1.5 m was placed in a grave that also contained the partial remains of two adults, possibly its crew. Even if we accept the doubtful assumption that war chariots needed a crew of two, many steppe chariots were big enough.<sup>32</sup>

Second, steppe chariots were not necessarily used as platforms for archers. The preferred weapon in the steppes might have been the javelin. A single

---

*Figure 15.13* Chariot grave at Krivoe Ozero, kurgan 9, grave 1, dated about 2000 BCE: (1–3) three typical Sintashta pots; (5–6) two pairs of studded disk cheek-pieces made of antler; (4) a bone and a flint projectile point; (7–8) a waisted bronze dagger and a flat bronze axe; (9–10) spoked wheel impressions from wheels set into slots in the floor of the grave; (11) detail of artist's reconstruction of the remains of the nave or hub on the left wheel. After Anthony and Vinogradov 1995, photos by Vinogradov.

warrior-driver could hold the reins in one hand and hurl a javelin with the other. From a standing position in a chariot, a driver-warrior could use his entire body to throw, whereas a man on horseback without stirrups (invented after 300 CE) could use only his arm and shoulder. A javelin-hurling charioteer could strike a man on horseback before the rider could strike him. Unlike a charioteer, a man on horseback could not carry a large sheath full of javelins and so would be at a double disadvantage if his first cast missed. A rider armed with a bow would fare only slightly better. Archers of the steppe Bronze Age seem to have used bows 1.2–1.5 m long, judging by bow remains found at Berezovka (k. 3, gr. 2) and Svatove (k. 12, gr. 12).<sup>33</sup> Bows this long could be fired from horseback only to the side (the left side, for a right-handed archer), which made riders with long bows vulnerable. A charioteer armed with javelins could therefore intimidate a Bronze Age rider on horseback. Many long-stemmed points, suitable for javelins, were found in some chariot graves (Sintashta SM gr. 4, 5, 30). If steppe charioteers used javelins, a single man could use narrower cars in warfare.

Third, if a single driver-warrior needed to switch to a bow in battle, he could fire arrows while guiding the horses with the reins around his hips. Tomb paintings depicted the Egyptian pharaoh driving and shooting a bow in this way. Although it may have been a convention to include only the pharaoh in these illustrations, Littauer noted that a royal Egyptian scribe was also shown driving and shooting in this way, and in paintings of Ramses III fighting the Libyans the archers in the Egyptian two-man chariots had the reins around their hips. Their car-mates helped to drive with one hand and used a shield with the other. Etruscan and Roman charioteers also frequently drove with the reins wrapped around their hips.<sup>34</sup> A single driver-warrior might have used a bow in this manner, although it would have been safer to shift the reins to one hand and cast a javelin.

The fourth reason not to dismiss the functionality of steppe chariots is that most of these chariots, including the narrow-gauge ones, were buried with weapons. I have seen complete inventories for twelve Sintashta and Petrovka chariot graves, and ten contained weapons. The most frequent weapons were projectile points, but chariot graves also contained metal-waisted daggers, flat metal axes, metal shaft-hole axes, polished stone mace heads, and one metal-socketed spearhead 20 cm long (from Sintashta SM gr. 30; see figure 15.3). According to Epimakhov's catalogue of Sintashta graves, cited earlier, all chariot graves where the skeleton could be assigned a gender contained an adult male. If steppe chariots were not designed for war, why were most of them buried with a male driver and weapons?

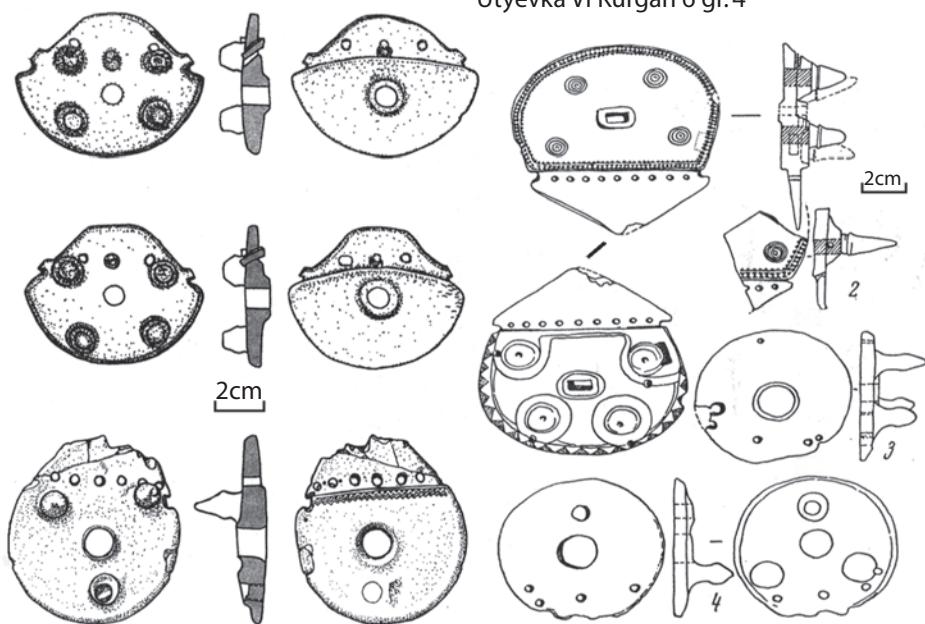
Fifth, a new kind of bridle cheekpiece appeared in the steppes at the very time that chariots did (see figure 15.14). It was made of antler or bone



Potapovka complex, middle Volga  
Utyevka VI Kurgan 6 gr. 5



Potapovka complex, middle Volga  
Utyevka VI Kurgan 6 gr. 4



Sintashta-Arkaim complex  
Kamennyi Ambar 5 Kurgan 2 Grave 8

Filatovskii kurgan, upper Don  
Grave 1, 2 pairs of cheekpieces

*Figure 15.14* Studded disk cheekpieces from graves of the Sintashta, Potapovka, and Filatovka types. The band of running spirals beneath the checkerboard panel on the upper left specimen from Utyevka VI was once thought to be derived from Mycenae. But the steppe examples like this one were older than Mycenae. Photos by the author; drawings after Epimakhov 2002; and Siniuk and Kosmirchuk 1995.

and shaped like an oblong disk or a shield, perforated in the center so that cords could pass through to connect the bit to the bridle and in various other places to allow for attachments to the noseband and cheek-strap. Pointed studs or prongs on its inner face pressed into the soft flesh at the corners of the horse's mouth when the driver pulled the reins on the opposite side, prompting an immediate response from the horse. The development of a new, more severe form of driving control suggests that rapid, precise maneuvers by the driving team were necessary. When disk cheekpieces are found in pairs, different shapes with different kinds of wear are often found together, as if the right and left sides of the horse, or the right and left horses, needed slightly different kinds of control. For example, at Krivoë Ozero (k. 9, gr. 1), the cheekpieces with the left horse had a slot located above the central hole, angled upward, toward the noseband (see figure 15.13). The cheekpieces with the right horse had no such upward-angled slot. A similar unmatched pair, with and without an upward-angled slot, were buried with a chariot team at Kamennyi Ambar 5 (see figure 15.14). The angled slot may have been for a noseband attached to the reins that would pull down on the inside (left) horse's nose, acting as a brake, when the reins were pulled, while the outside (right) horse was allowed to run free—just what a left-turning racing team would need. The chariot race, as described in the *Rig Veda*, was a frequent metaphor for life's challenges, and Vedic races turned to the left. Chariot cheekpieces of the same general design, a bone disk with sharp prongs on its inner face, appeared later in Shaft Grave IV at Mycenae and in the Levant at Tel Haror, made of metal. The oldest examples appeared in the steppes.<sup>35</sup>

Finally, the sixth flaw in the argument that steppe chariots were poorly designed imitations of superior Near Eastern originals is that the oldest examples of the former predate any of the dated chariot images in the Near East. Eight radiocarbon dates have been obtained from five Sintashta-culture graves containing the impressions of spoked wheels, including three at Sintashta (SM cemetery, gr. 5, 19, 28), one at Krivoë Ozero (k. 9, gr. 1), and one at Kammeny Ambar 5 (k. 2, gr. 8). Three of these ( $3760 \pm 120$  BP,  $3740 \pm 50$  BP, and  $3700 \pm 60$  BP), with probability distributions that fall predominantly before 2000 BCE, suggest that the earliest chariots probably appeared in the steppes before 2000 BCE (table 15.1). Disk-shaped cheekpieces, usually interpreted as specialized chariot gear, also occur in steppe graves of the Sintashta and Potapovka types dated by radiocarbon before 2000 BCE. In contrast, in the Near East the oldest images of true chariots—vehicles with *two spoked wheels*, pulled by *horses* rather than asses or onagers, controlled with *bits* rather than lip- or nose-

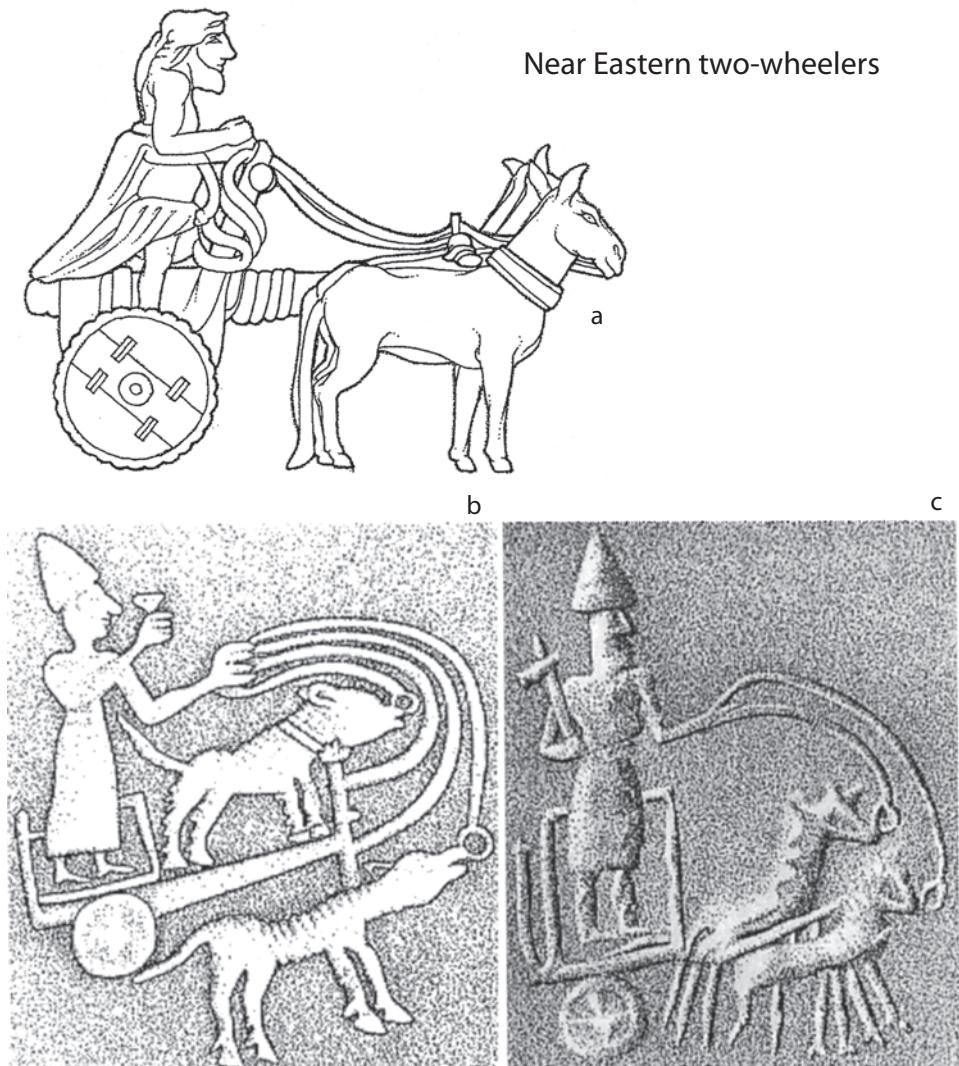
rings, and guided by a *standing warrior*, not a seated driver—first appeared about 1800 BCE, on Old Syrian seals. The oldest images in Near Eastern art of vehicles with two spoked wheels appeared on seals from Karum Kanesh II, dated about 1900 BCE, but the equids were of an uncertain type (possibly native asses or onagers) and they were controlled by nose-rings (see figure 15.15). Excavations at Tell Brak in northern Syria recovered 102 cart models and 191 equid figurines from the parts of this ancient walled caravan city dated to the late Akkadian and Ur III periods, 2350–2000 BCE by the standard or “middle” chronology. None of the equid figurines was clearly a horse. Two-wheeled carts were common among the vehicle models, but they had built-in seats and solid wheels. No chariot models were found. Chariots were unknown here as they were elsewhere in the Near East before about 1800 BCE.<sup>36</sup>

Chariots were invented earliest in the steppes, where they were used in warfare. They were introduced to the Near East through Central Asia, with steppe horses and studded disk cheekpieces (see chapter 16). The horse-drawn chariot was faster and more maneuverable than the old solid-wheeled battle-cart or battle-wagon that had been pulled into inter-urban battles by ass-onager hybrids in the armies of Early Dynastic, Akkadian, and Ur III kings between 2900 and 2000 BCE. These heavy, clumsy vehicles, mistakenly described as chariots in many books and catalogues, were similar to steppe chariots in one way: they were consistently depicted carrying javelin-hurling warriors, not archers. When horse-drawn chariots appeared in the Near East they quickly came to dominate inter-urban battles as swift platforms for archers, perhaps a Near Eastern innovation. Their wheels also were made differently, with just four or six spokes, apparently another improvement on the steppe design.

Among the Mitanni of northern Syria, in 1500–1350 BC, whose chariot tactics might have been imported with their Old Indic chariot terminology from a source somewhere in the steppes, chariots were organized into squadrons of five or six; six such units (thirty to thirty-six chariots) were combined with infantry under a brigade commander. A similar organization appeared in Chou China a millennium later: five chariots in a squadron, five squadrons in a brigade (twenty-five), with ten to twenty-five support infantry for each chariot.<sup>37</sup> Steppe chariots might also have operated in squadrons supported by individuals on foot or even on horseback, who could have run forward to pursue the enemy with hand weapons or to rescue the charioteer if he were thrown.

Chariots were effective in tribal wars in the steppes: they were noisy, fast, and intimidating, and provided an elevated platform from which a skilled

## Near Eastern two-wheeler



*Figure 15.15* Two-wheeled, high-speed vehicles of the ancient Near East prior to the appearance of the chariot: (a) cast copper model of a straddle-car with solid wheels pulled by a team of ass-onager-type equids from Tell Agrab, 2700–2500 BCE; (b and c) engraved seal images of vehicles with four-spoked wheels, pulled by equids (?) controlled with lip- or nose-rings from *karum* Kanesh II, 1900 BCE. After Raulwing 2000, figures 7.2 and 10.1.

driver could hurl a sheath full of javelins. As the car hit uneven ground at high speed, the driver's legs had to absorb each bounce, and the driver's weight had to shift to the bouncing side. To drive through a turn, the inside horse had to be pulled in while the outside horse was given rein. Doing this well and hurling a javelin at the same time required a lot of practice. Chariots were supreme advertisements of wealth; difficult to make and requiring great athletic skill *and* a team of specially trained horses to drive, they were available only to those who could delegate much of their daily labor to hired herders. A chariot was material proof that the driver was able to fund a substantial alliance or was supported by someone who had the means. Taken together, the evidence from fortifications, weapon types, and numbers, and the tactical innovation of chariot warfare, all indicate that conflict increased in both scale and intensity in the northern steppes during the early Sintashta period, after about 2100 BCE. It is also apparent that chariots played an important role in this new kind of conflict.

#### TOURNAMENTS OF VALUE

Parallels between the funerals of the Sintashta chiefs and the funeral hymns of the *Rig Veda* (see below) suggest that poetry surrounded chariot burials. Archaeology reveals that feasts on a surprising scale also accompanied chiefly funerals. Poetry and feasting were central to a mortuary performance that emphasized exclusivity, hierarchy, and power—what the anthropologist A. Appadurai called “tournaments of value,” ceremonies meant to define membership in the elite and to channel political competition within clear boundaries that excluded most people. In order to understand the nature of these sacrificial dramas, we first have to understand the everyday secular diet.<sup>38</sup>

Flotation of seeds and charcoal from the soils excavated at Arkaim recovered only a few charred grains of barley, too few, in fact, to be certain that they came from the Sintashta-culture site rather than a later occupation. The people buried at Arkaim had no dental caries, indicating that they ate a very low-starch diet, not starchy cereals.<sup>39</sup> Their teeth were like those of hunter-gatherers. Charred millet was found in test excavations at the walled Alands'koe stronghold, indicating that some millet cultivation probably occurred at some sites, and dental decay *was* found in the Krivoe Ozero cemetery population, so some communities might have consumed cultivated grain. Gathering wild seeds from *Chenopodium* and *Amaranthus*, plants that still played an important role in the LBA steppe diet centuries later (see chapter 16 for LBA wild plants), could have supplemented occasional cereal

cultivation. Cultivated cereals seem to have played a minor role in the Sintashta diet.<sup>40</sup>

The scale of animal sacrifices in Sintashta cemeteries implies very large funerals. One example was Sacrificial Complex 1 at the northern edge of the Sintashta SM cemetery (see figure 15.16). In a pit 50 cm deep, the heads and hooves of six horses, four cattle, and two rams lay in two rows facing one another around an overturned pot. This single sacrifice provided about six thousand pounds (2,700 kg) of meat, enough to supply each of three thousand participants with two pounds (.9 kg). The Bolshoi Kurgan, built just a few meters to the north, required, by one estimate, three thousand man-days.<sup>41</sup> The workforce required to build the kurgan matched the amount of food provided by Sacrificial Complex 1. However, the Bolshoi Kurgan was unique; the other burial mounds at Sintashta were small and low. If the sacrifices that accompanied the other burials at Sintashta were meant to feed work parties, what they built is not obvious. It seems more likely that most sacrifices were intended to provide food for the funeral guests. With up to eight horses sacrificed for a single funeral, Sintashta feasts would have fed hundreds, even thousands of guests. Feast-hosting behavior is the most common and consistently used avenue to prestige and power in tribal societies.<sup>42</sup>

The central role of horses in Sintashta funeral sacrifices was unprecedented in the steppes. Horse bones had appeared in EBA and earlier MBA graves but not in great numbers, and not as frequently as those of sheep or cattle. The animal bones from the Sintashta and Arkaim settlement refuse middens were 60% cattle, 26% sheep-goat, and 13% horse. Although beef supplied the preponderance of the meat diet, the funeral sacrifices in the cemeteries contained just 23% cattle, 37% sheep-goat, and 39% horse. Horses were sacrificed more than any other animal, and horse bones were three times more frequent in funeral sacrifices than in settlement middens. The zoologist L. Gaiduchenko suggested that the Arkaim citadel specialized in horse breeding for export because the high level of <sup>15</sup>N isotopes in human bone suggested that horses, very low in <sup>15</sup>N, were not eaten frequently. Foods derived from cattle and sheep, significantly higher in <sup>15</sup>N than the horses from these sites, probably composed most of the diet.<sup>43</sup> According to Epimakhov's catalogue of five Sintashta cemeteries, the most frequent animal sacrifices were horses but they were sacrificed in no more than 48 of the 181 graves catalogued, or 27%; multiple horses were sacrificed in just 13% of graves. About one-third of the graves contained weapons, but, among these, two-thirds of graves with horse sacrifices contained weapons, and 83% of graves with multiple horse sacrifices contained weapons. Only a minority of Sintashta graves contained



Sintashta cemetery SM sacrificial complex 1

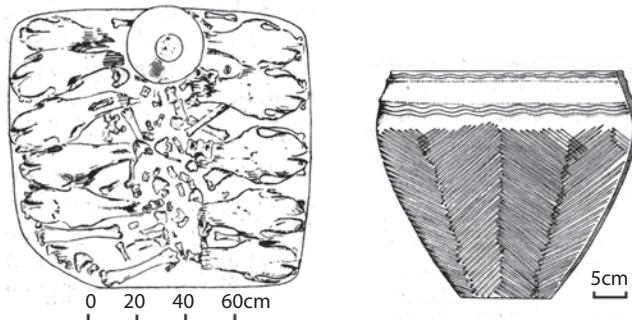


Figure 15.16 Sacrificial complex number 1 at the northern edge of the Sintashta SM cemetery. After Gening, Zdanovich, and Gening 1992, figure 130.

horse sacrifices, but those that did usually also contained weapons, a symbolic association between the ownership of large horse herds, the hosting of feasts, and the warrior's identity.

There is little jewelry or ornaments in Sintashta graves, and no large houses or storage facilities in the settlements. The signs of craft specialization, a

signal of social hierarchy, are weak in all crafts except metallurgy, but even in that craft, every household in every settlement seems to have worked metal. The absence of large houses, storage facilities, or craft specialists has led some experts to doubt whether the Sintashta culture had a strong social hierarchy.<sup>44</sup> Sintashta cemeteries contained the graves of a cross-section of the entire age and sex spectrum, including many children, apparently a more inclusive funeral ritual than had been normal in EBA and earlier MBA mortuary ceremonies in the steppes. On the other hand, most Sintashta cemeteries did not contain enough graves to account for more than a small segment of the population of the associated walled settlements. The Sintashta citadel included about fifty to sixty structures, and its associated cemeteries had just sixty-six graves, most of them the graves of children. If the settlement contained 250 people for six generations (150 years), it should have generated more than fifteen hundred graves. Only a few exceptional families were given funerals in Sintashta cemeteries, but the entire family, including children, was honored in this way. This privilege, like the sacrifice of horses and chariots, was not one that everyone could claim. Horses, chariots, weapons, and multiple animal sacrifices identified the graves of the Sintashta chiefs.

The funeral sacrifices of the Simtashta culture are a critical link between archaeology and history. They closely resembled the rituals described in the *Rig Veda*, the oldest text preserved in an Indo-Iranian language.

### SINTASHTA AND THE ORIGINS OF THE ARYANS

The oldest texts in Old Indic are the “family books,” books 2 through 7, of the *Rig Veda* (RV). These hymns and prayers were compiled into “books” or mandalas about 1500–1300 BCE, but many had been composed earlier. The oldest parts of the *Avesta* (AV), the Gathas, the oldest texts in Iranian, were composed by Zarathustra probably about 1200–1000 BCE. The undocumented language that was the parent of both, common Indo-Iranian, must be dated well before 1500 BCE, because, by this date, Old Indic had already appeared in the documents of the Mitanni in North Syria (see chapter 3). Common Indo-Iranian probably was spoken during the Sintashta period, 2100–1800 BCE. Archaic Old Indic probably emerged as a separate tongue from archaic Iranian about 1800–1600 BCE (see chapter 16). The RV and AV agreed that the essence of their shared parental Indo-Iranian identity was linguistic and ritual, not racial. If a person sacrificed to the right gods in the right way using the correct forms of the traditional hymns and poems, that person was an Aryan.<sup>45</sup> Other-

wise the individual was a *Dasyu*, again not a racial or ethnic label but a ritual and linguistic one—a person who interrupted the cycle of giving between gods and humans, and therefore a person who threatened cosmic order, *r'ta* (RV) or *asa* (AV). Rituals performed *in the right words* were the core of being an Aryan.

Similarities between the rituals excavated at Sintashta and Arkaim and those described later in the RV have solved, for many, the problem of Indo-Iranian origins.<sup>46</sup> The parallels include a reference in RV 10.18 to a kurgan (“let them . . . bury death in this hill”), a roofed burial chamber supported with posts (“let the fathers hold up this pillar for you”), and with shored walls (“I shore up the earth all around you; let me not injure you as I lay down this clod of earth”). This is a precise description of Sintashta and Potapovka-Filatovka grave pits, which had wooden plank roofs supported by timber posts and plank shoring walls. The horse sacrifice at a royal funeral is described in RV 1.162: “Keep the limbs undamaged and place them in the proper pattern. Cut them apart, calling out piece by piece.” The horse sacrifices in Sintashta, Potapovka, and Filatovka graves match this description, with the lower legs of horses carefully cut apart at the joints and placed in and over the grave. The preference for horses as sacrificial animals in Sintashta funeral rituals, a species choice setting Sintashta apart from earlier steppe cultures, was again paralleled in the RV. Another verse in the same hymn read: “Those who see that the racehorse is cooked, who say, ‘It smells good! Take it away!’ and who wait for the doling out of the flesh of the charger—let their approval encourage us.” These lines describe the public feasting that surrounded the funeral of an important person, exactly like the feasting implied by head-and-hoof deposits of horses, cattle, goats, and sheep in Sintashta graves that would have yielded hundreds or even thousands of kilos of meat. In RV 5.85, Varuna released the rain by overturning a pot: “Varuna has poured out the cask, turning its mouth downward. With it the king of the whole universe waters the soil.” In Sacrificial Deposit 1 at Sintashta an overturned pot was placed between two rows of sacrificed animals—in a ritual possibly associated with the construction of the enormous Bolshoi Kurgan.<sup>47</sup> Finally, the RV eloquently documents the importance of the poetry and speech making that accompanied all these events. “Let us speak great words as men of power in the sacrificial gathering” was the standard closing attached repeatedly to several different hymns (RV 2.12, 2.23, 2.28) in one of the “family books.” These public performances played an important role in attracting and converting celebrants to the Indo-Iranian ritual system and language.

The explosion of Sintashta innovations in rituals, politics, and warfare had a long-lasting impact on the later cultures of the Eurasian steppes. This is another reason why the Sintashta culture is the best and clearest candidate for the crucible of Indo-Iranian identity and language. Both the Srubnaya and the Andronovo horizons, the principal cultural groups of the Late Bronze Age in the Eurasian steppes (see chapter 16), grew from origins in the Potapovka-Sintashta complex.

A Srubnaya site excavated by this author contained surprising evidence for one more parallel between Indo-Iranian (and perhaps even Proto-Indo-European) ritual and archaeological evidence in the steppes: the midwinter New Year's sacrifice and initiation ceremony, held on the winter solstice. Many Indo-European myths and rituals contained references to this event. One of its functions was to initiate young men into the warrior category (*Männerbünde, korios*), and its principal symbol was the dog or wolf. Dogs represented death; multiple dogs or a multi-headed dog (*Cerberus, Saranyu*) guarded the entrance to the Afterworld. At initiation, death came to both the old year and boyhood identities, and as boys became warriors they would feed the dogs of death. In the RV the oath brotherhood of warriors that performed sacrifices at midwinter were called the Vrâtyas, who also were called dog-priests. The ceremonies associated with them featured many contests, including poetry recitation and chariot races.<sup>48</sup>

At the Srubnaya settlement of Krasnosamarskoe (Krasno-sa-MAR-sko-yeh) in the Samara River valley, we found the remains of an LBA midwinter dog sacrifice, a remarkable parallel to the reconstructed midwinter New Year ritual, dated about 1750 BCE. The dogs were butchered only at midwinter, many of them near the winter solstice, whereas the cattle and sheep at this site were butchered throughout the year. Dogs accounted for 40% of all the animal bones from the site. At least eighteen dogs were butchered, probably more. Nerissa Russell's studies showed that each dog head was burned and then carefully chopped into ten to twelve small, neat, almost identical segments with axe blows. The postcranial remains were not chopped into ritually standardized little pieces, and none of the cattle or sheep was butchered like this. The excavated structure at Krasnosamarskoe probably was the place where the dog remains from a midwinter sacrifice were discarded after the event. They were found in an archaeological context assigned to the early Srubnaya culture, but early Srubnaya was a direct outgrowth from Potapovka and Abashevo, the same circle as Sintashta, and nearly the same date. Krasnosamarskoe shows that midwinter dog sacrifices were practiced in the middle Volga steppes, as in

the dog-priest initiation rituals described in the RV. Although such direct evidence for midwinter dog rituals has not yet been recognized in Sintashta settlements, many individuals buried in Sintashta graves wore necklaces of dog canine teeth. Nineteen dog canine pendants were found in a single collective grave with eight youths—probably of initiation age—under a Sintashta kurgan at Kammenyi Ambar 5, kurgan 4, grave 2.<sup>49</sup>

In many small ways the cultures between the upper Don and Tobol rivers in the northern steppes showed a common kinship with the Aryans of the *Rig Veda* and *Avesta*. Between 2100 and 1800 BCE they invented the chariot, organized themselves into stronghold-based chiefdoms, armed themselves with new kinds of weapons, created a new style of funeral rituals that involved spectacular public displays of wealth and generosity, and began to mine and produce metals on a scale previously unimagined in the steppes. Their actions reverberated across the Eurasian continent. The northern forest frontier began to dissolve east of the Urals as it had earlier west of the Urals; metallurgy and some aspects of Sintashta settlement designs spread north into the Siberian forests. Chariotry spread west through the Ukrainian steppe MVK culture into southeastern Europe's Monteoru (phase Ic1-Ib), Vatin, and Otomani cultures, perhaps with the *satəm* dialects that later popped up in Armenian, Albanian, and Phrygian, all of which are thought to have evolved in southeastern Europe. (Pre-Greek must have departed before this, as it did not share in the *satəm* innovations.) And the Ural frontier was finally broken—herding economies spread eastward across the steppes. With them went the eastern daughters of Sintashta, the offspring who would later emerge into history as the Iranian and Vedic Aryans. These eastern and southern connections finally brought northern steppe cultures into face-to-face contact with the old civilizations of Asia.

## CHAPTER SIXTEEN



### The Opening of the Eurasian Steppes

Between about 2300 and 2000 BCE the sinews of trade and conquest began to pull the far-flung pieces of the ancient world together into a single interacting system. The mainspring that drove inter-regional trade was the voracious demand of the Asiatic cities for metal, gems, ornamental stones, exotic woods, leather goods, animals, slaves, and power. Participants gained access to and control over knowledge of the urban centers and their power-attracting abilities—a source of social prestige in most societies.<sup>1</sup> Ultimately, whether through cultural means of emulation and resistance or political means of treaty and alliance, a variety of regional centers linked their fortunes to those of the paramount cities of the Near East, Iran, and South Asia. Regional centers in turn extended their influence outward, partly in a search for raw materials for trade, and partly to feed their own internal appetites for power. On the edges of this expanding, uncoordinated system of consumption and competition were tribal cultures that probably had little awareness of its urban core, at least initially (figures 16.1 and 16.2). But eventually they were drawn in. By 1500 BCE chariot-driving mercenaries not too far removed from the Eurasian steppes, speaking an Old Indic language, created the Mitanni dynasty in northern Syria in the heart of the urban Near East.<sup>2</sup>

How did tribal chiefs from the steppes intrude into the dynastic politics of the Near East? Where else did they go? To understand the crucial role that Eurasian steppe cultures played in the knitting together of the ancient world during the Bronze Age, we should begin in the heartland of cities, where the demand for raw materials was greatest.

#### BRONZE AGE EMPIRES AND THE HORSE TRADE

About 2350 BCE Sargon of Akkad conquered and united the feuding kingdoms of Mesopotamia and northern Syria into a single super-state—



Figure 16.1 Cultures of the steppes and the Asian civilizations between about 2200 and 1800 BCE, with the locations of proven Bronze Age mines in the steppes and the Zeravshan valley.

the first time the world's oldest cities were ruled by one king. The Akkadian state lasted about 170 years. It had economic and political interests in western and central Iran, leading to increased trade, occasionally backed up by military expeditions. Images of horses, distinguished from asses and onagers by their hanging manes, short ears, and bushy tails, began to appear in Near Eastern art during the Akkadian period, although they still were rare and exotic animals. Some Akkadian seals had images of men riding equids in violent scenes of conflict (figure 16.3). Perhaps a few Akkadian horses were acquired from the chiefs and princes of western Iran known to the Akkadians as the Elamites.

Elamite was a non-Indo-European language, now extinct, then spoken across western Iran. A string of walled cities and trade centers stood on the Iranian plateau, revealed by excavations at Godin, Malyan, Konar Sandal, Hissar, Shar-i-Sokhta, Shahdad, and other places. Malyan, the ancient city of Anshan, the largest city on the plateau, certainly was an

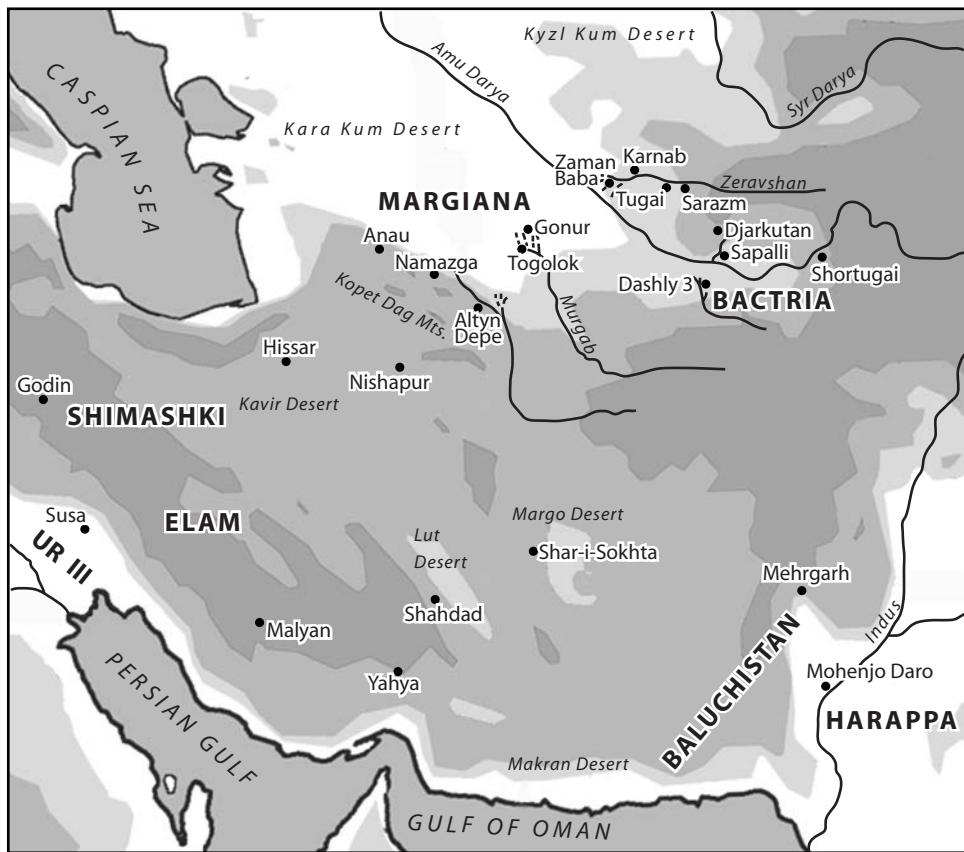


Figure 16.2 Civilizations of Mesopotamia, Iran, Central Asia, and the Indus valley about 2200–1800 BCE.

Elamite city allied to the Elamite king in Susa. Some of the other brick-built towns, almost all of them smaller than Malyan, were part of an alliance called Shimashki, located north of Malyan and south of the Caspian Sea. Among the fifty-nine personal names recorded in the Shimashki alliance, only twelve can be classified as Elamite; the others are from unknown non-Indo-European languages. East of the Iranian plateau, the Harappan civilization of Indo-Pakistan, centered in huge mudbrick cities on the Indus River, used its own script to record a language that has not been definitively deciphered but might have been related to modern Dravidian. The Harappan cities exported precious stones, tropical woods, and metals westward on ships that sailed up the Persian Gulf, through a chain



*Figure 16.3* Early images of men riding equids in the Near East and Central Asia: (top) Akkadian seal impression from Kish, 2350–2200 BCE (after Buchanan 1966); (middle) seal impression of the BMAC from a looted grave in Afghanistan, 2100–1800 BCE (after Sarianidi 1986); (bottom) Ur III seal impression of Abbakalla, animal disburser for king Shu-Sin, 2050–2040 BCE (after Owen 1991).

of coastal kingdoms scattered from Oman to Kuwait. Harappa probably was the country referred to as “Melukkha” in the Mesopotamian cuneiform records.<sup>3</sup>

Akkadian armies and trade networks reached far and wide, but inside Akkad was an enemy it could not conquer with arms: crop failure. During the Akkadian era the climate became cooler and drier, and the agricultural economy of the empire suffered. Harvey Weiss of Yale has argued that some northern Akkadian cities were entirely abandoned, and their populations might have moved south into the irrigated floodplains of southern Mesopotamia.<sup>4</sup> The Gutians, a coalition of chiefs from the western Iranian uplands (perhaps Azerbaijan?) defeated the Akkadian army and overran the city of Akkad in 2170 BCE. Its ruins have never been found.

About 2100 BCE the first king of the Third Dynasty of Ur, even then an ancient Sumerian city in what is now southern Iraq, expelled the Gutians and reestablished the power of southern Mesopotamia. The brief Ur III period, 2100–2000 BCE, was the last time that Sumerian, the language of the first cities, was a language of royal administration. A century of bitter wars erupted between the Sumerian Ur III kings and the Elamite city-states of the Iranian plateau, occasionally interrupted by negotiations and marriage exchanges. King Shu-Sin of Ur bragged that he conquered a path across Elam and through Shimashki until his armies finally were stopped only by the Caspian Sea.

During this period of struggle and empire, 2100–2000 BCE, the bones of horses appeared for the first time at important sites on the Iranian plateau such as the large city of Malyan in Fars and the fortified administrative center at Godin Tepe in western Iran. Bit wear made with a hard bit, probably metal, appeared on the teeth of some of the equids (both mules and horses) from Malyan. Excavated by Bill Sumner and brought by Mindy Zeder to the collections of the Smithsonian Museum of Natural History in Washington, D.C. these teeth were the first archaeological specimens that we examined when we started our bit wear project in 1985. Now we know what then we only suspected: the horses and mules of the Kaftari phase at Malyan were bitted with hard bits. Bits were a new technology for controlling equids in Iran, different from the lip- and nose-rings that had appeared before this in Mesopotamian works of art. Of course bits and bit-wear were very old in the steppes by 2000 BCE.<sup>5</sup>

Horses also appeared in significant numbers in the cities of Mesopotamia for the first time during the Ur III period; this was when the word for *horse* first appeared in written records. It meant “ass of the mountains,” showing that horses were flowing into Mesopotamia from western Iran

and eastern Anatolia. The Ur III kings fed horses to lions for exotic entertainment. They did not use horse-drawn chariots, which had not yet appeared in Near Eastern warfare. But they did have solid-wheeled battle wagons and battle carts armed with javelins, pulled by teams of their smaller native equids—asses, which were manageable but small, and onagers or hemiones, which were almost untamable but larger. Ass-onager hybrids probably pulled Sumerian battle carts and battle wagons. Horses could have been used initially as breeding stock to make a larger, stronger ass-horse hybrid—a mule. Mules were bitted at Malyan.

The Sumerians recognized in horses an arched-neck pride that asses and onagers simply did not possess. King Shulgi compared himself in one inscription to “a horse of the highway that swishes his tail.” We are not sure exactly what horses were doing on Ur III highways, but a seal impression of one Abbakalla, the royal animal disburser for king Shu-Sin, showed a man riding a galloping equid that looks like a horse (see figure 16.3).<sup>6</sup> Ceramic figurines of the same age showed humans astride schematic animals that have equine proportions; and ceramic plaques dated at the time of Ur III or just afterward showed men astride equids that probably were horses, some riding in awkward poses on the rump and others in more natural forward seats. No Ur III images showed a chariot, so the first clear images of horses in Mesopotamia show men riding them.<sup>7</sup>

About 2000 BCE an Elamite and Shimashki alliance defeated the last of the Ur III kings, Ibbi-Sin, and dragged him to Elam in chains. After this stunning event the kings of Elam and Shimashki played a controlling role in Mesopotamian politics for several centuries. Between 2000 and 1700 BCE the power, independence, and wealth of the Old Elamite (Malyan) and Shimashkian (Hissar? Godin?) overlords of the Iranian plateau was at its height. The treaties they negotiated for the Ur III wars were sealed by gifts and trade agreements that channeled lapis lazuli, carved steatite vessels, copper, tin, and horses from one prince to another. The Sintashta culture appeared at just the same time, but showed up 2000 km to the north in the remote grasslands of the Ural-Tobol steppes. The metal trade and the horse trade might have tied the two worlds together. Could the Elamite defeat of Ibbi-Sin have been aided by chariot-driving Sintashta mercenaries from the steppes? It is possible. Vehicles like chariots, with two spoked wheels and a standing driver, but guided by equids with lip- or nose-rings, began to appear on seal images in Anatolia just after the defeat of Ibbi-Sin. They were not yet common, but that was about to change.

The metal trade might have provided the initial incentive for prospectors to explore across the Central Asian deserts that had previously separated

the northern Eurasian steppe cultures from those of Iran. Vast amounts of metal were demanded by Near Eastern merchants during the heyday of the Old Elamite kings. Zimri-Lim, king of the powerful city-state of Mari in northern Syria between 1776 and 1761 BCE, distributed gifts totaling more than 410 kg (905 lb) of tin—not bronze, but tin—to his allies during a single tour in his eighth year. Zimri-Lim also was chided by an adviser for riding a horse in public, an activity still considered insulting to the honor of an Assyrian king:<sup>8</sup>

May my lord honor his kingship. You may be the king of the Haneans, but you are also the king of the Akkadians. May my Lord not ride horses; (instead) let him ride either a chariot or *kudanu*-mule so that he would honor his kingship.

Zimri-Lim's advisers accepted the fact that kings could ride in chariots—Near Eastern monarchs had by then ridden in wheeled vehicles of other kinds for more than a thousand years. But only rude barbarians actually rode on the backs of the large, sweaty, smelly animals that pulled them. Horses, in Zimri-Lim's day, were still exotic animals associated with crude foreigners. A steady supply of horses first began between 2100 and 2000 BCE. Chariots appeared across the Near East after 2000 BCE. How?

#### *The Tin Trade and the Gateway to the North*

Tin was the most important trade commodity in the Bronze Age Near East. In the palace records of Mari it was said to be worth ten times its weight in silver. A copper-tin alloy was easier for the metal smith to cast, and it made a harder, lighter-colored metal than either pure copper or arsenical bronze, the older alternatives. But the source of Near Eastern tin remains an enigma. Large tin deposits existed in England and Malaysia, but these places were far beyond the reach of Near Eastern traders in the Bronze Age. There were small tin deposits in western Serbia—and a scatter of Old European copper objects from the Danube valley contained elevated tin, perhaps derived from this source—but no ancient mines have been found there. Ancient mines in eastern Anatolia near Goltepe might have supplied a trickle of tin before 2000 BCE, but their proven tin content is very low, and tin was *imported* at great cost to Anatolia from northern Syria after 2000 BCE. It was imported into northern Syria from somewhere far to the east. The letters of king Zimri-Lim of Mari said flatly that he acquired his tin from Elam, through merchants at Malyan (Anshan) and Susa. An inscription on a statue of Gudea of Lagash, ca.

2100 BCE, was thought to refer to the “tin of Melukkha,” implying that tin came up the Arabian Gulf in ships sent by Harappan merchants; but the passage might have been mistranslated. Intentional tin-bronze alloys occurred in about 30% of the objects tested from the Indus-valley cities of Mohenjo-Daro and Harappa, although most had such a low tin content (70% of them had only 1% tin, 99% copper) that it seems the best recipe for tin bronze (8–12% tin, 92–88% copper) was not yet known in Harappa. Still, “Melukkha” could have been one source of Mesopotamian tin. Tin-bronzes have been found in sites in Oman, at the entrance to the Arabian Gulf, in association with imported pottery and beads from Harappa and bone combs and seals made in Bactria. Oman had no tin of its own but could have been a coastal port and trans-shipment point for tin that came from the Indus valley.<sup>9</sup>

Where were the tin mines? Could the tin exported by the Elamite kings and by Harappan merchants have come from the same sources? Quite possibly. The most probable sources were in western and northern Afghanistan, where tin ore has been found by modern mineral surveyors, although no ancient mines have been found there, and also in the Zeravshan River valley, where the oldest tin mines in the ancient world have been found near the site of Sarazm. Sarazm also was the portal through which horses, chariots, and steppe cultures first arrived at the edges of Central Asia.

Sarazm was founded before 3500 BCE ( $4880 \pm 30$  BP,  $4940 \pm 30$  BP for phase I) as a northern colony of the Namazga I-II culture. The Namazga home settlements (Namazga, Anau, Altyn-Depe, Geoksur) were farming towns situated on alluvial fans where the rivers that flowed off the Iranian plateau emerged into the Central Asian deserts. Perhaps the lure that enticed Namazga farmers to venture north across the Kara Kum desert to Sarazm was the turquoise that outcropped in the desert near the lower Zeravshan River, a source they could have learned about from Kelteminar foragers. Sarazm probably was founded as a collection point for turquoise. It was situated on the middle Zeravshan more than 100 km upstream from the turquoise deposits at an elevation where the valley was lush and green and crops could be grown. It grew to a large town, eventually covering more than 30 ha (74 acres). Its people were buried with ornaments of turquoise, carnelian, silver, copper, and lapis lazuli. Late Kelteminar pottery was found at Sarazm in its phase II, dated about 3000–2600 BCE ( $4230 \pm 40$  BP), and turquoise workshops have been found in the late Kelteminar camps of Kaptarnikum and Lyavlyakan in the desert near the lower Zeravshan. Turquoise from the Zeravshan and from a second source

near Nishapur in northeastern Iran was traded into Mesopotamia, the Indus valley, and perhaps even to Maikop (the Maikop chieftain was buried with a necklace of turquoise beads). But the Zeravshan also contained polymetallic deposits of copper, lead, silver—and tin.

Oddly, no tin has been found at Sarazm itself. Crucibles, slag, and smelting furnaces appeared at Sarazm at least as early as the phase III settlement (radiocarbon dated 2400–2000 BCE), probably for processing the rich copper deposits in the Zeravshan valley. Sarazm III yielded a variety of copper knives, daggers, mirrors, fishhooks, awls, and broad-headed pins. Most were made of pure copper, but a few objects contained 1.8–2.7% arsenic, probably an intentional arsenical bronze. Tin-bronzes began to appear in small amounts in the Kopet Dag home region, in Altyn-Depe and Namazga, during the Namazga IV period, equivalent to late Sarazm II and III. A small amount of tin, perhaps just placer minerals retrieved from the river, probably came from the Zeravshan before 2000 BCE, even if we cannot see it at Sarazm.<sup>10</sup>

The tin mines of the Zeravshan River valley were found and investigated by N. Boroffka and H. Parzinger between 1997 and 1999.<sup>11</sup> Two tin mines with Bronze Age workings were excavated. The largest was in the desert on the lower Zeravshan at Karnab (Uzbekistan), about 170 km west of Sarazm, exploiting cassiterite ores with a moderate tin content—probably ordinarily about 3%, although some samples yielded as much as 22% tin. The pottery and radiocarbon dates show that the Karnab mine was worked by people from the northern steppes, connected with the Andronovo horizon (see below). Dates ranged from 1900 to 1300 BCE (the oldest was Bln 5127,  $3476 \pm 32$  BP, or 1900–1750 BCE; see table 16.1). A few pieces of Namazga V/VI pottery were found in the Andronovo mining camp at Karnab. The other mining complex was at Mushiston in the upper Zeravshan (Tajikistan), just 40 km east of Sarazm, working stannite, cassiterite and copper ores with a very high tin content (maximum 34%). Andronovo miners also left their pottery at Mushiston, where wood beams produced radiocarbon dates as old as Karnab. Sarazm probably was abandoned when these Andronovo mining operations began. Whether the Zeravshan tin mines were worked before the steppe cultures arrived is unknown.

Sarazm probably was abandoned around 2000 BCE, just at the Namazga V/VI transition. On the lower Zeravshan, the smaller villages of the Zaman Baba culture probably were abandoned about the same time as Sarazm.<sup>12</sup> The Zaman Baba culture had established small villages of pit-houses supported by irrigation agriculture in the large oasis in the lower

Zeravshan delta just a couple of centuries earlier. Zaman Baba and Sarazm were abandoned when people from the northern steppes arrived in the Zeravshan.<sup>13</sup>

Sarazm exported both copper and turquoise southward during the Akkadian and Ur III periods. Could it have pulled steppe copper miners and horse traders into the chain of supply for the urban trade? Could that explain the sudden intensification of copper production in Sintashta settlements and the simultaneous appearance of horses in Iran and Mesopotamia beginning about 2100 BCE? The answer lies among the ruins of walled cities in Central Asia south of Sarazm, cities that interacted with the cultures of the northern steppes before the Andronovo tin miners appeared on the Zeravshan frontier.

#### THE BACTRIA-MARGIANA ARCHAEOLOGICAL COMPLEX

Around 2100 BCE a substantial population colonized the Murgab River delta north of the Iranian plateau. The Murgab River flowed down from the mountains of western Afghanistan, snaked across 180 km of desert, then fanned out into the sands, dropping deep loads of silt and creating a fertile island of vegetation about 80 by 100 km in size. This was Margiana, a region that quickly became and remained one of the richest oases in Central Asia. The immigrants built new walled towns, temples, and palaces (Gonur, Togolok) on virgin soil during the late Namazga V period, at the end of the regional Middle Bronze Age (figure 16.4). They might have been escaping from the military conflicts that raged periodically across the Iranian plateau, or they might have relocated to a larger river system with more reliable flows in a period of intensifying drought. Anthropological studies of their skeletons show that they came from the Iranian plateau, and their pottery types seem to have been derived from the Namazga V-type towns of the Kopet Dag.<sup>14</sup>

The colonization phase in Margiana, 2100–2000 BCE, was followed by a much richer period, 2000–1800 BCE, during Namazga VI, the beginning of the regional Late Bronze Age. New walled towns now spread to the upper Amu Darya valley, ancient Bactria, where Sapalli-Tepe, Dashly-3, and Djarkutan were erected on virgin soil. The towns of Bactria and Margiana shared a distinctive set of seal types, architectural styles, brick-lined tomb types, and pottery. The LBA civilization of Bactria and Margiana is called the Bactria-Margiana Archaeological Complex (BMAC). The irrigated countryside was dominated by large towns surrounded by thick yellow-brick walls with narrow gates and high corner towers. At the

TABLE 16.1

Selected Radiocarbon Dates from Earlier Late Bronze Age Cultures in the Steppes

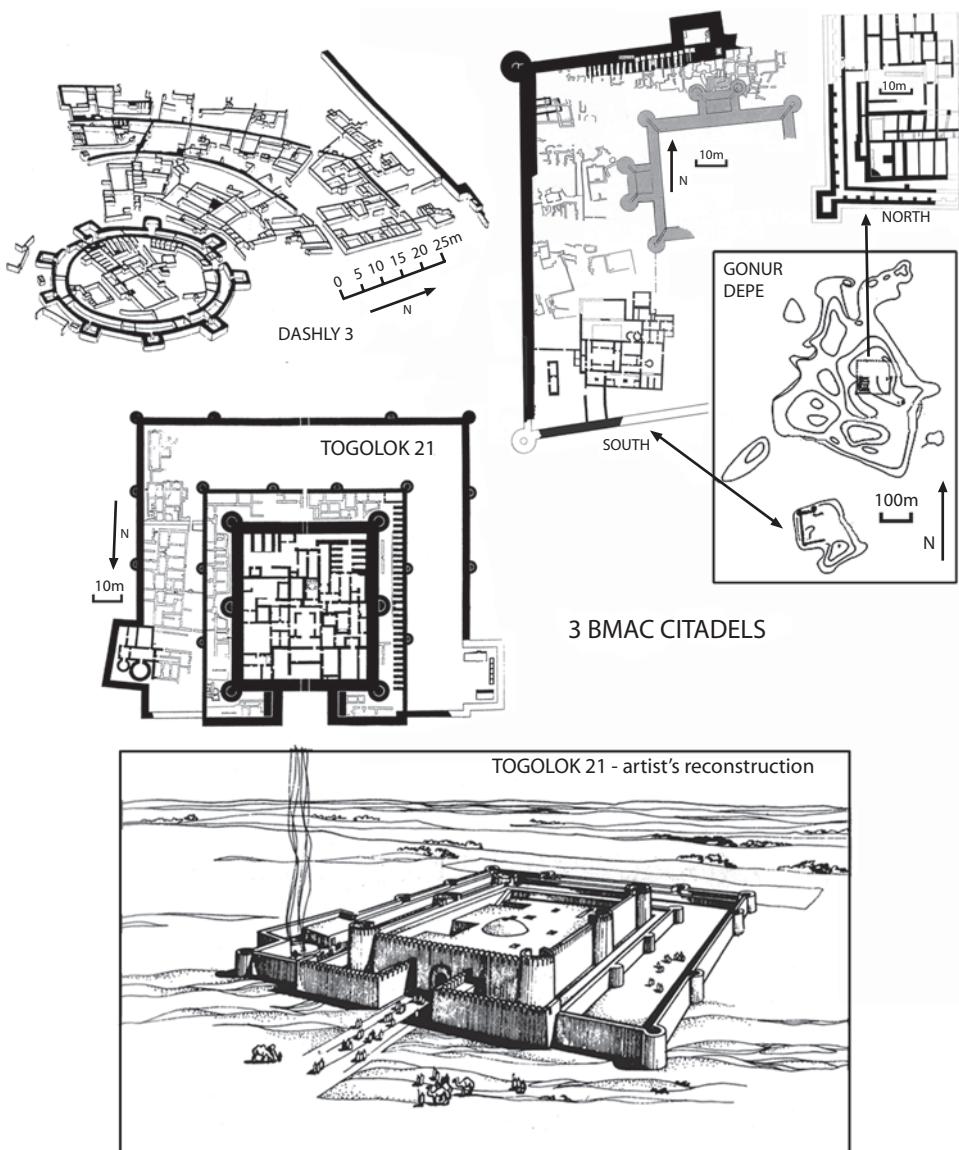
<i>Lab Number</i>	<i>BP Date</i>	<i>Kurgan</i>	<i>Grave</i>	<i>Mean Intercept BCE</i>	<i>BCE</i>
1. Krasnosamarskoe kurgan cemetery IV, Samara oblast, LBA Pokrovka and Srubnaya graves					
AA37038	3490±57	kurgan 3	1	1859, 1847, 1772	1881–1740
AA37039	3411±46	kurgan 3	6	1731, 1727, 1686	1747–1631
AA37042	3594±45	kurgan 3	10	1931	1981–1880
AA37043	3416±57	kurgan 3	11	1733, 1724, 1688	1769–1623
AA37044	3407±46	kurgan 3	13	1670, 1668, 1632	1685–1529
AA37045	3407±46	kurgan 3	16	1730, 1685	1744–1631
AA37046	3545±65	kurgan 3	17	1883	1940–1766
AA37047	3425±52	kurgan 3	23	1735, 1718, 1693	1772–1671
2. Krasnosamarskoe settlement, Samara oblast					
Structure floor and cultural level outside structure, Pokrovka and Srubnaya occupations					
		<i>Square/quad</i>	<i>level</i>		
AA41022	3531±43	L5	2	3	1879, 1832, 1826, 1790
AA41023	3445±51	M5	1	7	1741
AA41024	3453±43	M6	3	7	1743
AA41025	3469±45	N3	3	7	1748
AA41026	3491±52	N4	2	6	1860, 1846, 1772
AA41027	3460±52	O4	1	7	1745
AA41028	3450±57	O4	2	5	1742
AA41029	3470±43	P1	4	6	1748
AA41030	3477±39	S2	3	4	1752
AA41031	3476±38	R1	2	5	1750
AA41032	3448±47	N2	2	4	1742
AA47790	3311±54	O5	3	3	1598, 1567, 1530
AA47796	3416±59	Y2	2	4	1736, 1713, 1692
AA47797	3450±50	Y1	3	5	1742
Waterlogged Pokrovka artifacts from deep pit interpreted as a well inside the structure					
AA47793	3615±41	M2	4	-276	1948
AA47794	3492±55	M2	4	-280	1860, 1846, 1773
AA47795	3550±54	M2	4	-300	1884

TABLE 16.1 (*continued*)

<i>Lab Number</i>	<i>BP Date</i>	<i>Kurgan</i>	<i>Grave</i>	<i>Mean Intercept BCE</i>	<i>BCE</i>
Srubnaya and Pokrovka artifacts from eroded part of settlement on the lake bottom					
AA47791	3494±56	Lake find 1	0	1862, 1845, 1774	1881–1742
AA47792	3492±55	Lake find 2	0	1860, 1846, 1773	1829–1742
Srubnaya herding camp at PD1 in the Peschanyi Dol valley					
AA47798	3480±52	A 16	3	3	1789–1737
AA47799	3565±55	I 18	2	2	1964–1872
3. Karnab mining camp, Zeravshan valley, Uzbekistan, Andronovo–Alakul occupation					
Bln-5127	3476±32				1880–1740
Bln-141274	3280±40				1620–1510
Bln-141275	3170±50				1520–1400
Bln-5126	3130±44				1490–1310
4. Alakul–Andronovo settlements and kurgan graves					
Alakul kurgan 15, grave 1					
Le-924	3360±50	charcoal			1740–1530
Subbotino kurgan 17, grave 3					
Le-1126	3460±50	wood			1880–1690
Subbotino kurgan 18, central grave					
Le-1196	3000±50	wood			1680–1510
Tasty–Butak settlement					
Rul-614	3550±65	wood, pit 14			2010–1770
Le-213	3190±80	wood, pit 11			1600–1320

center of the larger towns were walled palaces or citadels that contained temples. The brick houses and streets of Djarkutan covered almost 100 ha, commanded by a high-walled citadel about 100 by 100 m. Local lords ruled from smaller strongholds such as Togolok 1, just .5 ha (1.2 acres) in size but heavily walled with large corner turrets. Trade and crafts flourished in the crowded houses and alleys of these Central Asian walled towns and fortresses. Their rulers had relations with the civilizations of Mesopotamia, Elam, Harappa, and the Arabian Gulf.

Between 2000 and 1800 BCE, BMAC styles and exported objects (notably small jars made of carved steatite) appeared in many sites and



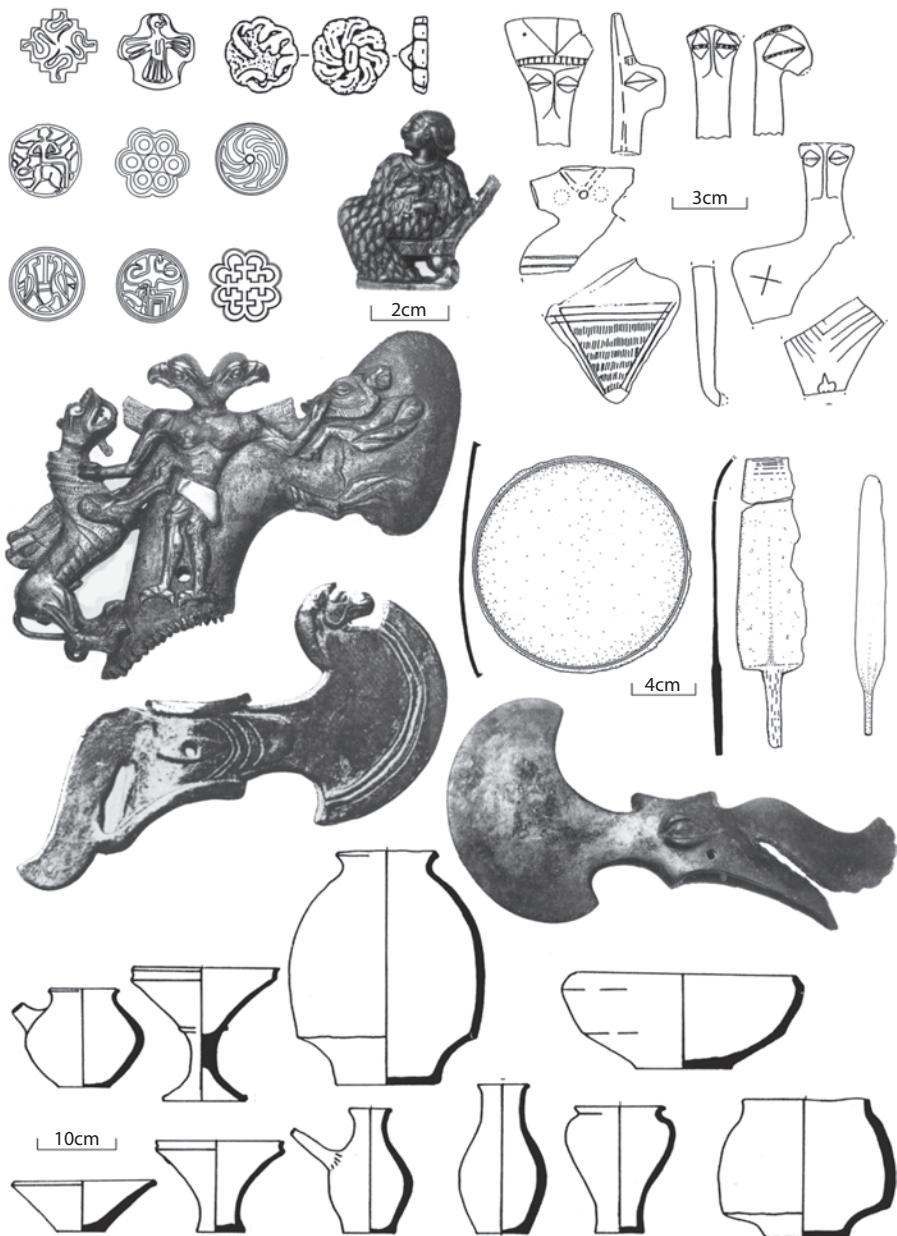
*Figure 16.4* Three walled towns of the Bactria-Margiana Archaeological Complex (BMAC) in Central Asia, 2100–1800 BCE. Wall foundations of the central circular citadel/temple and town at Dashly 3, Bactria (after Sarianidi 1977, figure 13); wall foundations at Gonur Depe, Margiana (combined from Hiebert 1994; and Sarianidi 1995); wall foundations and artist's reconstruction of Togolok 21, Margiana (after Hiebert 1994; and Sarianidi 1987).

cemeteries across the Iranian plateau. Crested axes like those of the BMAC appeared at Shadad and other sites in eastern and central Iran. A cemetery at Mehrgarh VIII in Baluchistan, on the border between the Harappan and Elamite civilizations, contained so many BMAC artifacts that it suggests an actual movement of BMAC people into Baluchistan. BMAC-style sealings, ivory combs, steatite vessels, and pottery goblets appeared in the Arabian Gulf from Umm-al-Nar on the Oman peninsula up the Arabian coast to Falaika island in Kuwait. Beadmakers in BMAC towns used shells obtained from both the Indian Ocean (*Enigma medicaria*, *Lambis truncate sebae*) and the Mediterranean Sea (*Nassarius gibbosulus*), as well as steatite, alabaster, lapis lazuli, turquoise, silver, and gold.<sup>15</sup>

The metalsmiths of the BMAC made beautiful objects of bronze, lead, silver, and gold. They cast delicate metal figures by the lost-wax process, which made it possible to cast very detailed metal objects. They made crested bronze shaft-hole axes with distinctive down-curving blades, tanged daggers, mirrors, pins decorated with cast animal and human figures, and a variety of distinctive metal compartmented seals (figure 16.5). The metals used in the first colonization period, late Namazga V, were unalloyed copper, arsenical bronze, and a copper-lead alloy with up to 8–10% lead.

About 2000 BCE, during the Namazga VI/BMAC period, tin-bronze suddenly appeared prominently in sites of the BMAC. Tin-bronzes were common at two BMAC sites, Sapalli and Djarkutan, reaching more than 50% of objects, although at neighboring Dashly-3, also in Bactria, tin-bronzes were just 9% of metal objects. Tin-bronzes were rare in Margiana (less than 10% of metal objects at Gonur, none at all at Togolok). Tin-bronze was abundant only in Bactria, closer to the Zeravshan. It looks like the tin mines of the Zeravshan were established or greatly expanded at the beginning of the mature BMAC period, about 2000 BCE.<sup>16</sup>

There were no wild horses in Central Asia. The native equids were onagers. Wild horses had not previously strayed south of what is today central Kazakhstan. Any horses found in BMAC sites must have been traded in from the steppes far off to the north. The animal bones discarded in and near BMAC settlements contained no horse bones. Hunters occasionally killed wild onagers but not horses. Most of the bones recovered from the settlement trash deposits were from sheep or goats. Asian zebu cattle and domesticated Bactrian camels also appeared. They were shown pulling wagons and carts in BMAC artwork. Small funeral wagons with solid wooden-plank wheels and bronze-studded tires were buried in royal graves associated with the first building phase, dated about 2100–2000 BCE, at



*Figure 16.5* Artifacts of the Bactria-Margiana Archaeological Complex, 2100–1800 BCE: (top left) a sample of BMAC stamp seals, adapted after Salvatori 2000, and Hiebert 1994; (top center) cast silver pin head from Gonur North showing a goddess in a ritual dress, after Klochkov 1998, figure 3; (top right) ceramic female figurines from Gonur North, after Hiebert 1994; (center left)

Gonur in Margiana (called Gonur North, because the oldest phase was found at the northern end of the modern ruins).

In these graves at Gonur, associated with the early settlement of Gonur North, one horse was found. A brick-lined grave pit contained the contorted bodies of ten adult humans who were apparently killed in the grave itself, one of whom fell across a small funeral wagon with solid wooden wheels. The grave also contained a whole dog, a whole camel, and the decapitated body of a horse foal (the reverse of an Aryan horse sacrifice). This grave is thought to have been a sacrificial offering that accompanied a nearby “royal” tomb. The royal tomb contained funeral gifts that included a bronze image of a horse head, probably a pommel decoration on a wooden staff. Another horse head image appeared as a decoration on a crested copper axe of the BMAC type, unfortunately obtained on the art market and now housed in the Louvre. Finally, a BMAC-style seal probably looted from a BMAC cemetery in Bactria (Afghanistan) showed a man riding a galloping equid that looks very much like a horse (see figure 16.3). The design was similar to the contemporary galloping-horse-and-rider image on the Ur III seal of Abbakalla, dated 2040–2050 BCE. Both seals showed a galloping horse, a rider with a hair-knot on the back of his head, and a man walking.

These finds suggest that horses began to appear in Central Asia about 2100–2000 BCE but never were used for food. They appeared only as decorative symbols on high-status objects and, in one case, in a funeral sacrifice. Given their simultaneous appearance across Iran and Mesopotamia, and the position of BMAC between the steppes and the southern civilizations, horses were probably a trade commodity. After chariots were introduced to the princes of the BMAC, Iran, and the Near East around 2000–1900 BCE, the demand for horses could easily have been on the order of tens of thousands of animals annually.<sup>17</sup>

#### *Steppe Immigrants in Central Asia*

Fred Hiebert’s excavations at the walled town of Gonur North in Margiana, dated 2100–2000 BCE, turned up a few sherds of strange pottery,

---

*Figure 16.5 (continued)* crested shaft-hole axes from the art market, probably from BMAC sites, with a possible horse-head on the lower one, after Aruz 1998, figure 24; and Amiet 1986, figure 167; (center right) a crested axe with eye amulet, and a copper mirror and dagger excavated from Gonur North, after Hiebert 1994; and Sarianidi 1995, figure 22; (bottom) ceramic vessel shapes from Gonur, after Hiebert 1994.

unlike any other pottery at Gonur. It was made with a paddle-and-anvil technique on a cloth-lined form—the clay was pounded over an upright cloth-covered pot to make the basic shape, and then was removed and finished. This is how Sintashta pottery was made. These strange sherds were imported from the steppe. At this stage (equivalent to early Sintashta) there was very little steppe pottery at Gonur, but it was there, at the same time a horse foal was thrown into a sacrificial pit in the Gonur North cemetery. Another possible trace of this early phase of contact were “Abashevo-like” pottery sherds decorated with horizontal channels, found at the tin miners’ camp at Karnab on the lower Zeravshan. Late Abashevo was contemporary with Sintashta.

During the classic phase of the BMAC, 2000–1800 BCE, contact with steppe people became much more visible. Steppe pots were brought into the rural stronghold at Togolok 1 in Margiana, inside the larger palace/temple at Togolok 21, inside the central citadel at Gonur South, and inside the walled palace/temple at Djarkutan in Bactria (figure 16.6). These sherds were clearly from steppe cultures. Similar designs can be found on Sintashta pots at Krivoe Ozero (k. 9, gr. 3; k. 10, gr. 13) but were more common on pottery of early Andronovo (Alakul variant) type, dated after 1900–1800 BCE—pottery like that used by the Andronovo miners at Karnab. Although the amount of steppe pottery in classic BMAC sites is small, it is widespread, and there is no doubt that it derived from northern steppe cultures. In these contexts, dated 2000–1800 BCE, the most likely steppe sources were the Petrovka culture at Tugai or the first Alakul-Andronovo tin miners at Karnab, both located in the Zeravshan valley.<sup>18</sup>

The Petrovka settlement at Tugai appeared just 27 km downstream (west) of Sarazm, not far from the later site of Samarkand, the greatest caravan trading city of medieval Central Asia. Perhaps Tugai had a similar, if more modest, function in an early north-south trade network. The Petrovka culture (see below) was an eastern offshoot of Sintashta. The Petrovka people at Tugai constructed two copper-smelting ovens, crucibles with copper slag, and at least one dwelling. Their pottery included at least twenty-two pots made with the paddle-and-anvil technique on a cloth-lined form. Most of them were made of clay tempered with crushed shell, the standard mixture for Petrovka potters, but two were tempered with crushed talc/steatite minerals. Talc-tempered clays were typical of Sintashta, Abashevo, and even forest-zone pottery of Ural forager cultures, so these two pots probably were carried to the

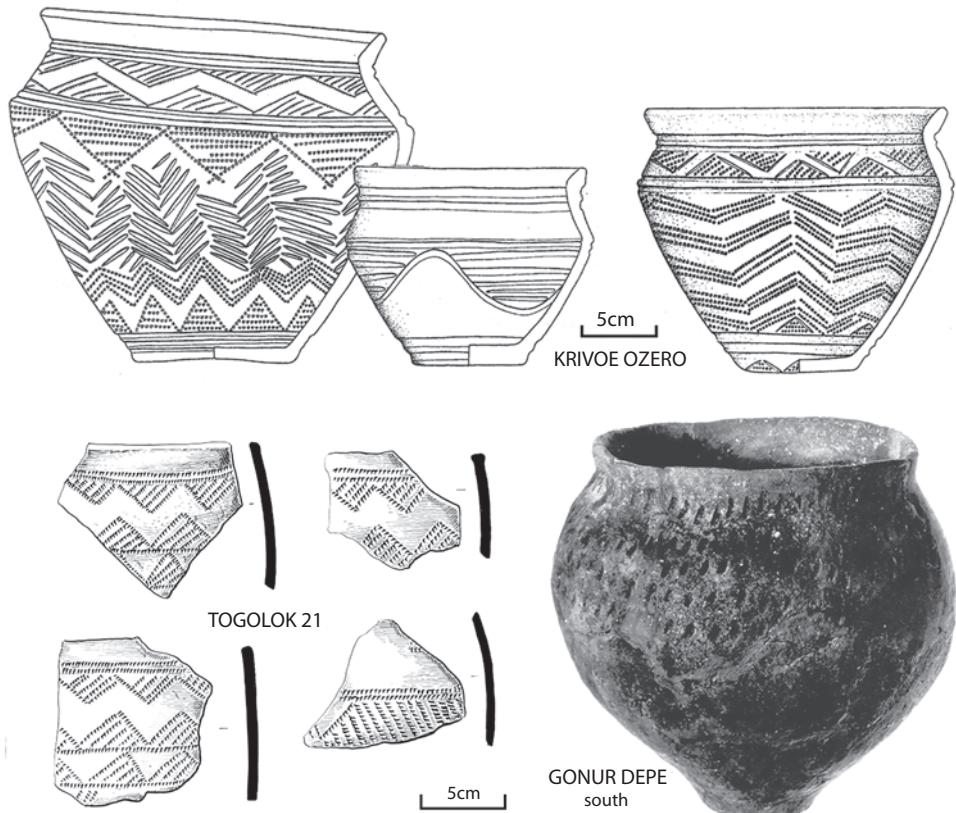
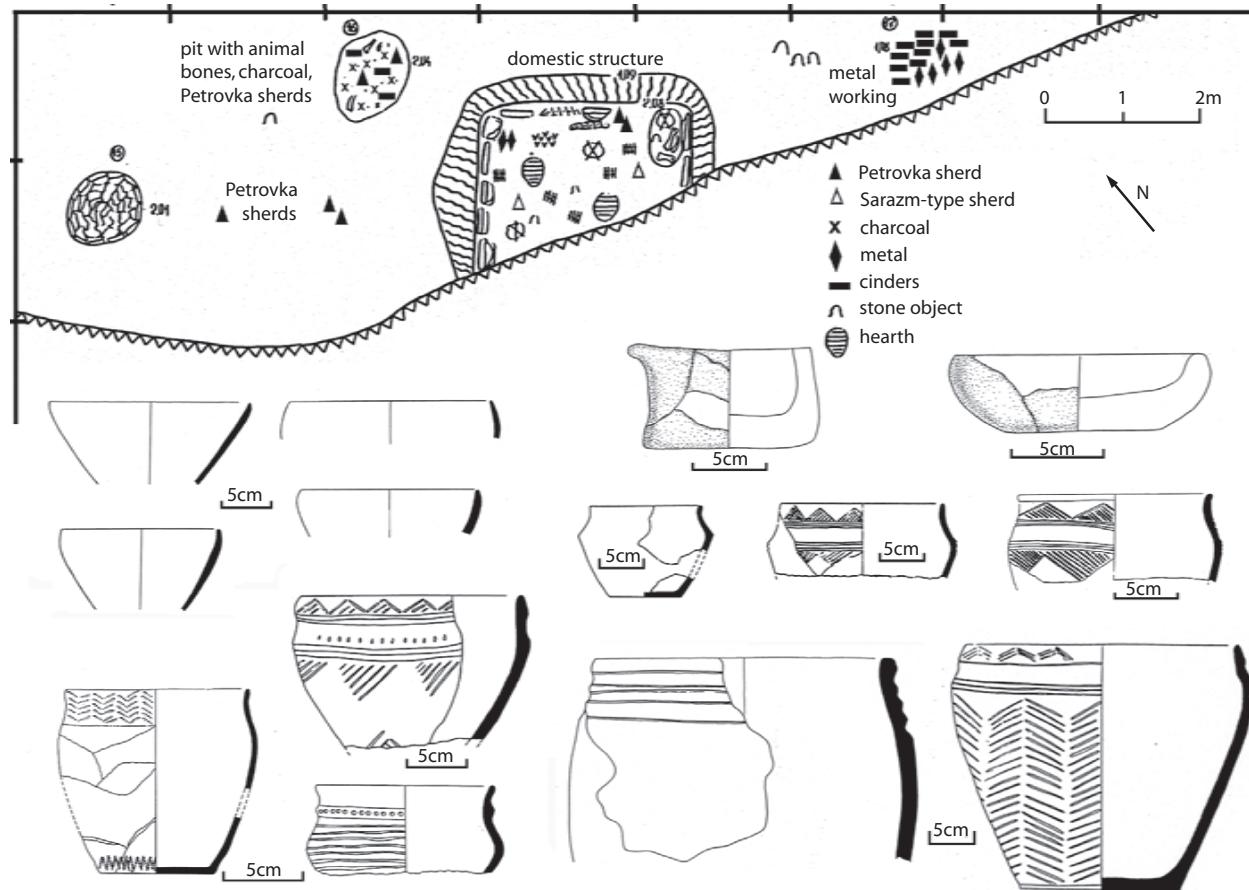


Figure 16.6 A whole steppe pot found inside the walls of the Gonur South town, after Hiebert 1994; steppe sherds with zig-zag decoration found inside the walls of Togolok 1, after Kuzmina 2003; and similar motifs on Sintashta sherds from graves at Krivoje Ozero, Ural steppes, after Vinogradov 2003, figures 39 and 74.

Zeravshan from the Ural steppes. The pottery shapes and impressed designs were classic early Petrovka (figure 16.7). A substantial group of Petrovka people apparently moved from the Ural-Ishim steppes to Tugai, probably in wagons loaded with pottery and other possessions. They left garbage middens with the bones of cattle, sheep, and goats, but they did not eat horses—although their Petrovka relatives in the northern steppes did. Tugai also contained sherds of wheel-made cups in red-polished and black-polished fabrics typical of the latest phase at Sarazm (IV). The



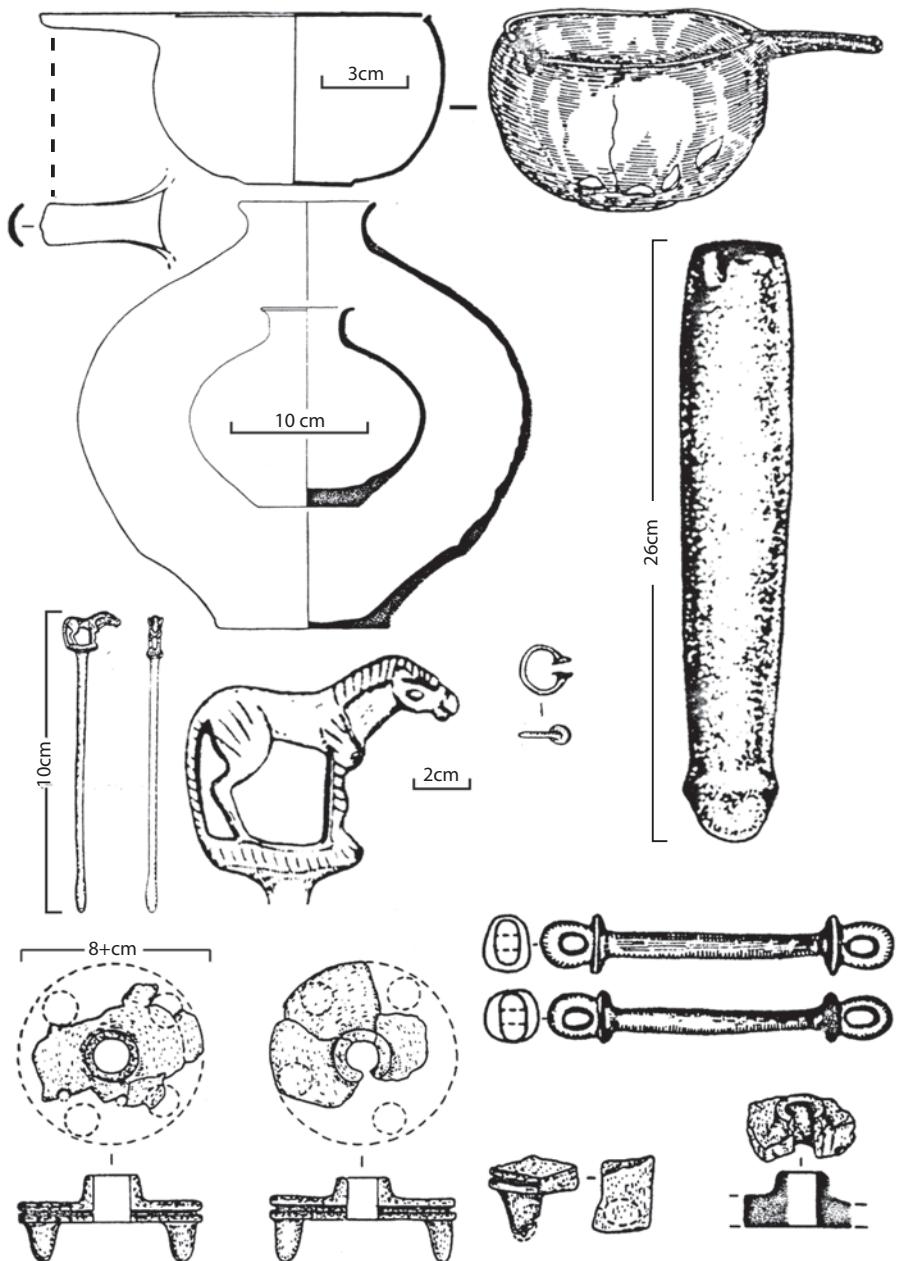
principal activity identified in the small excavated area was copper smelting.<sup>19</sup>

The steppe immigrants at Tugai brought chariots with them. A grave at Zardcha-Khalifa 1 km east of Sarazm contained a male buried in a contracted pose on his right side, head to the northwest, in a large oval pit, 3.2 m by 2.1 m, with the skeleton of a ram.<sup>20</sup> The grave gifts included three wheel-made Namazga VI ceramic pots, typical of the wares made in Bactrian sites of the BMAC such as Sappali and Dzharkutan; a trough-spouted bronze vessel (typical of BMAC) and fragments of two others; a pair of gold trumpet-shaped earrings; a gold button; a bronze straight-pin with a small cast horse on one end; a stone pestle; two bronze bar bits with looped ends; and two largely complete bone disc-shaped cheekpieces of the Sintashta type, with fragments of two others (figure 16.8). The two bronze bar bits are the oldest known metal bits anywhere. With the four cheekpieces they suggest equipment for a chariot team. The cheekpieces were a specific Sintashta type (the raised bump around the central hole is the key typological detail), though disc-shaped studded cheekpieces also appeared in many Petrovka graves. Stone pestles also frequently appeared in Sintashta and Petrovka graves. The Zardcha-Khalifa grave probably was that of an immigrant from the north who had acquired many BMAC luxury objects. He was buried with the only known BMAC-made pin with the figure of a horse—perhaps made just for him. The Zardcha-Khalifa chief may have been a horse dealer. The Zeravshan valley and the Ferghana valley just to the north might have become the breeding ground at this time for the fine horses for which they were known in later antiquity.

The fabric-impressed pottery and the sacrificed horse foal at Gonur North and perhaps the Abashevo (?) sherds at Karnab represent the exploratory phase of contact and trade between the northern steppes and the southern urban civilizations about 2100–2000 BCE, during the period when the kings of Ur III still dominated Elam. Information and perhaps even cult practices from the south flowed back to early Sintashta societies. On the eastern frontier in Kazakhstan, where Petrovka was budding off from Sintashta, the lure of the south prompted a migration across more

---

*Figure 16.7* The Petrovka settlement at Tugai on the Zeravshan River: (*top*) plan of excavation; (*center left*) imported redware pottery like that of Sarazm IV; (*center right*) two coarse ceramic crucibles from the metal-working area; (*bottom*) Petrovka pottery. Adapted from Avanessova 1996.



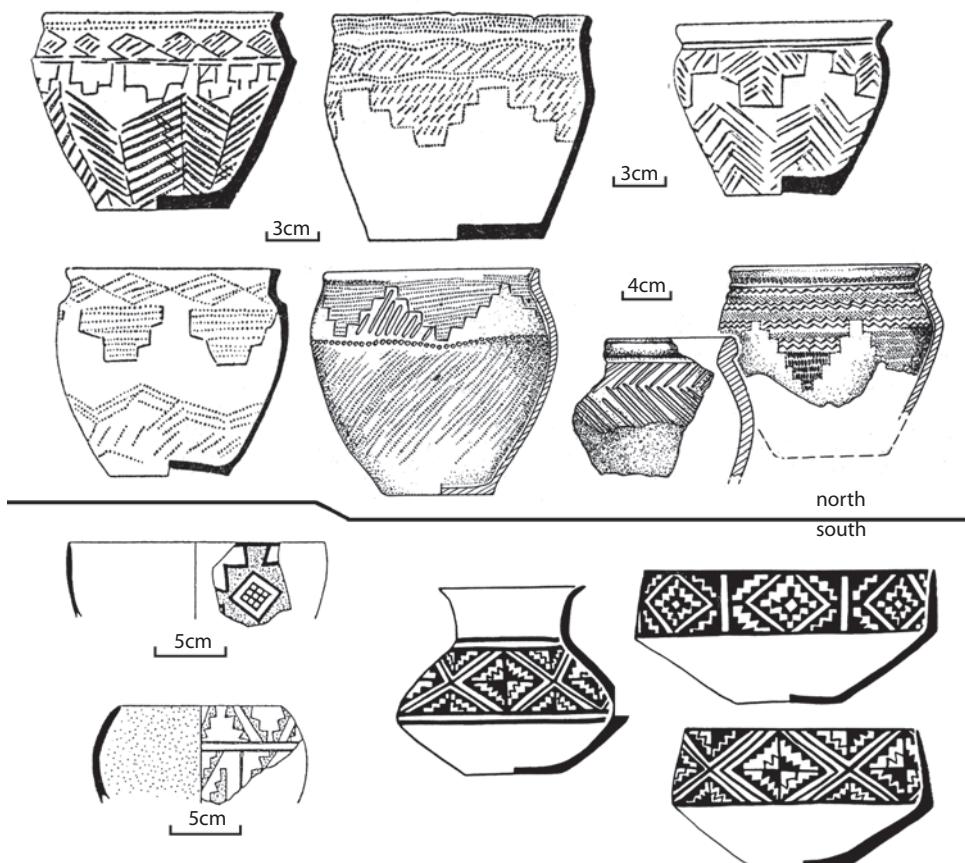
*Figure 16.8* Objects from the grave at Zardcha-Khalifa on the Zeravshan River. The trough-spouted bronze vessel and ceramic pots are typical of the BMAC, 2000–1800 BCE; the cast copper horse pin shows BMAC casting methods; the bronze bar bits are the first ones dated this early; and the stone pestle, trumpet-shaped earring, and bone cheekpieces are steppe types. After Bobomulloev 1997, figures 2, 3, and 4.

than a thousand kilometers of hostile desert. The establishment of the Petrovka metal-working colony at Tugai, probably around 1900 BCE, was the beginning of the second phase, marked by the actual migration of chariot-driving tribes from the north into Central Asia. Sarazm and the irrigation-fed Zaman-Baba villages were abandoned about when the Petrovka miners arrived at Tugai. The steppe tribes quickly appropriated the ore sources of the Zeravshan, and their horses and chariots might have made it impossible for the men of Sarazm to defend themselves.

### *Central Asian Trade Goods in the Steppes*

Did any BMAC products appear in Sintashta or Petrovka settlements? Only a few hints of a return trade can be identified. One intriguing innovation was a new design motif, the stepped pyramid or crenellation. Stepped pyramids or crenellations appeared on the pottery of Sintashta, Potapovka, and Petrovka. The stepped pyramid was the basic element in the decorative artwork on Namazga, Sarazm, and BMAC pottery, jewelry, metalwork, and even in a mural painted on the Proto-Elamite palace wall at Malyan (figure 16.9, bottom). Repeated horizontally, the stepped pyramid became a line of crenellated designs; repeated on four sides, it became a stepped cross. This motif had not appeared in any earlier pottery in the steppes, neither in the Bronze Age nor the Eneolithic. Charts of design motifs are regularly published in Russian archaeological ceramic studies. I have scanned these charts for years and have not found the stepped pyramid in any assemblage earlier than Sintashta. Stepped pyramids appeared for the first time on northern steppe pottery just when northern steppe pottery first showed up in BMAC sites. It was seen first on a small percentage (<5%) of Potapovka pottery on the middle Volga (single vessels in Potapovka kurgans 1, 2, 3, and 5) and at about the same frequency on Sintashta pottery in the Ural-Tobol steppes; later it became a standard design element in Petrovka and Andronovo pottery (but not in Srubnaya pottery, west of the Urals). Although no Sarazm or BMAC pottery has been found in Sintashta contexts, the design could have been conveyed to the northern steppes on textiles—perhaps the commodity exchanged for northern metal. I would guess that Sintashta potters copied the design from imported BMAC textiles.

There are other indications of contact. A lead wire made of two braided strands was found among the metal objects in the Sintashta settlement of Kuisak. Lead had never before appeared in the northern steppes as a pure metal, whereas a single ingot of lead weighing 10 kg was found at Sarazm.



*Figure 16.9* Stepped pyramid or crenellation motifs on steppe pottery and on Central Asian pottery: (top row and left pot in second row) Potapovka graves, middle Volga region, 2100–1800 BCE, after Vasiliev, Kuznetsov, and Semenova 1994, figures 20 and 22; (middle row, remaining pots) Sintashta SII cemetery, grave 1, after Gening, Zdanovich and Gening 1992, figure 172; (bottom left) Sarazm, level II, 3000–2500 BCE, after Lyonnet 1996, figures 4 and 12; (bottom right) Altyn-Depe, excavation 1, burial 296, after Masson 1988, plate 27.

The Kuishak lead wire probably was an import from the Zeravshan. A lapis lazuli bead from Afghanistan was found at Sintashta. A Bactrian-handled bronze mirror was found in a Sintashta grave at Krasnoe Znamya.<sup>21</sup> Finally, the technique of lost-wax metal casting first appeared in the north during the Sintashta period, in metal objects of Seima-Turbino

type (described in more detail below). Lost-wax casting was familiar to BMAC metalsmiths. Southern decorative motifs (stepped pyramids), raw materials (lead and lapis lazuli), one mirror, and metal-working techniques (lost-wax casting) appeared in the north just when northern pottery, chariot-driving cheekpieces, bit wear, and horse bones appeared in the south.

The sudden shift to large-scale copper production that began about 2100–2000 BCE in the earliest Sintashta settlements must have been stimulated by a sharp increase in demand. Central Asia is the most likely source. The increase in metal production deeply affected the internal politics of northern steppe societies, which quickly became accustomed to using and consuming large quantities of bronze. Although the northern steppe producers probably had direct contact with the Central Asian market only for a short time, internal demand in the steppes remained high throughout the LBA. Once the metallurgical pump was primed, so to speak, it continued to flow. The priming happened because of contact with urban markets, but the flow after that raised the usage of metal in the steppes and in the forest zone to the north, starting an internal European cycle of exchange that would lead to a metal boom in the Eurasian steppes after 2100 BCE.

After 1900 BCE a contact zone developed in the Zeravshan valley and extended southward to include the central citadels in the BMAC towns. In the Zeravshan, migrants from the northern steppes mixed with late Kelteminar and BMAC-derived populations. The Old Indic dialects probably evolved and separated from the developing Iranian dialects in this setting. To understand how the Zeravshan-Bactrian contact zone separated itself from the northern steppes, we need to examine what happened in the northern steppes after the end of the Sintashta culture.

### THE OPENING OF THE EURASIAN STEPPES

The Srubnaya (or Timber-Grave) culture was the most important LBA culture of the western steppes, from the Urals to the Dnieper (figure 16.10). The Andronovo horizon was the primary LBA complex of the eastern steppes, from the Urals to the Altai and the Tien Shan. Both grew from the Potapovka-Sintashta complex between the middle Volga and the Tobol. With the appearance of Srubnaya and Andronovo between about 1900 and 1800 BCE, for the first time in history a chain of broadly similar cultures extended from the edges of China to the frontiers of Europe. Innovations and raw materials began to move across the continent. The steppe world was not just a conduit, it also became an innovating

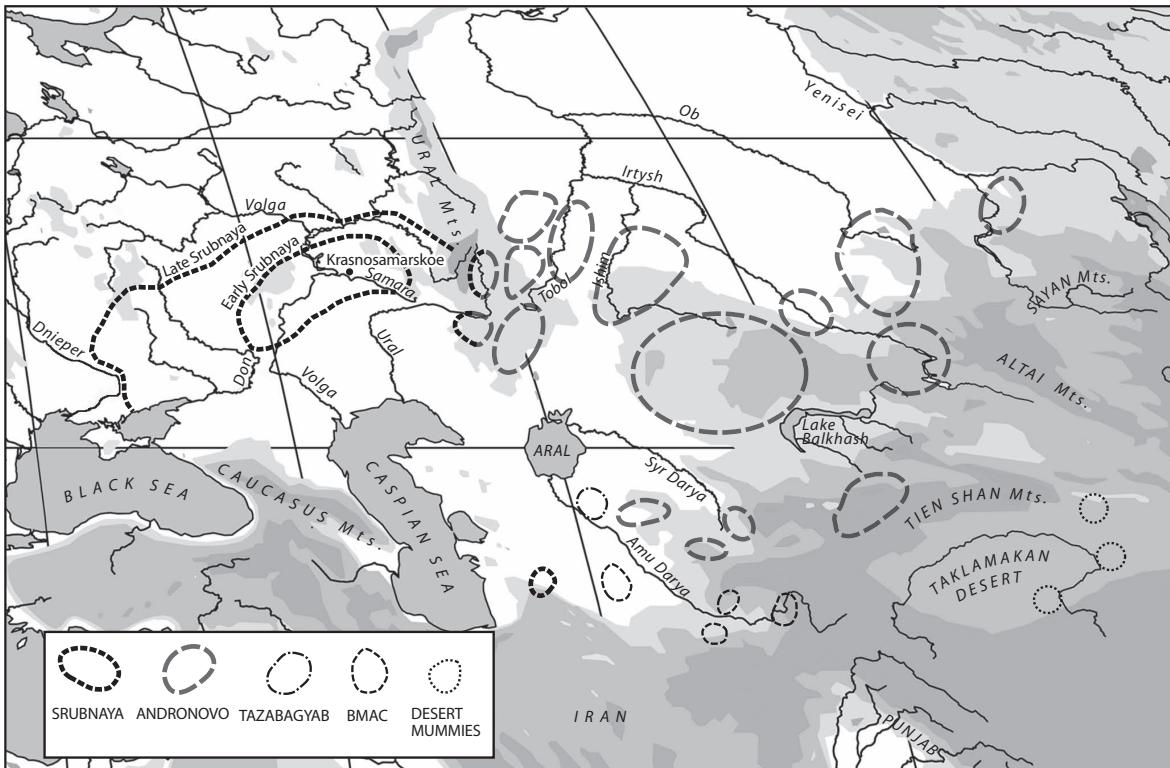


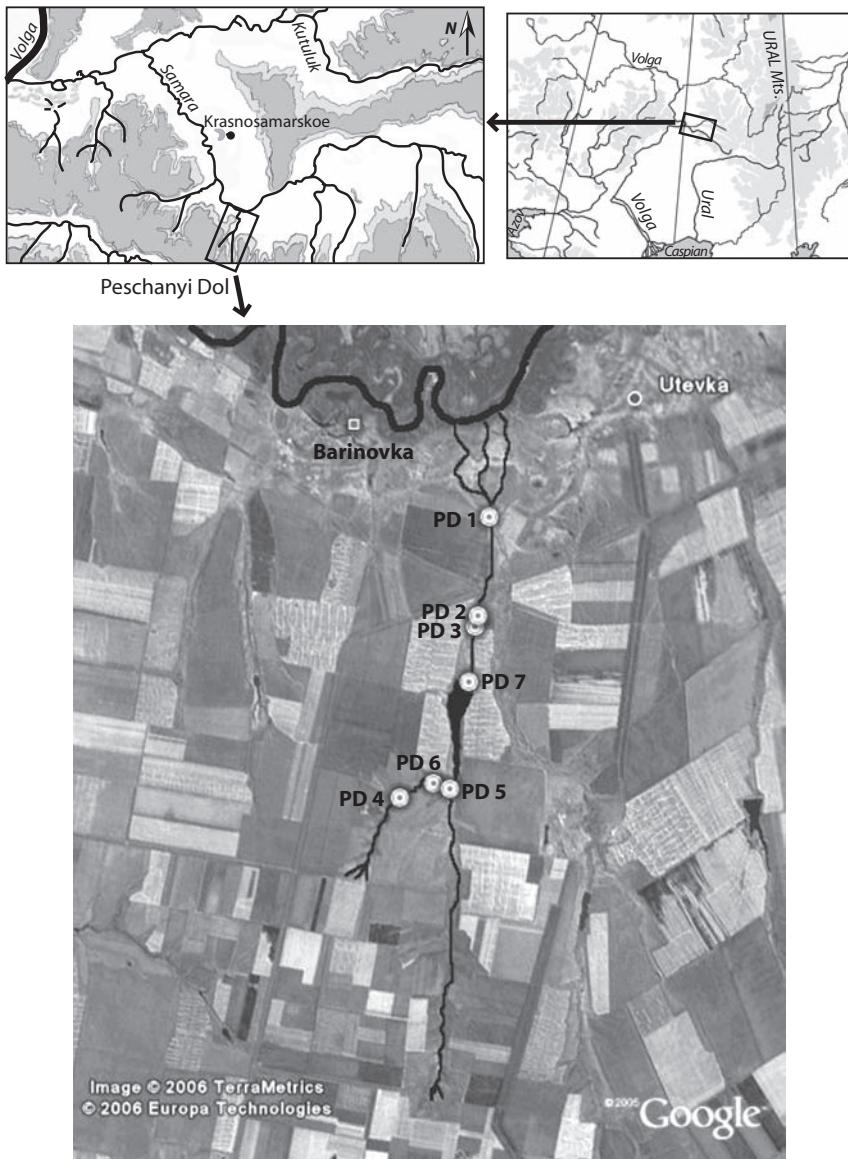
Figure 16.10 The Late Bronze Age cultures of the Eurasian steppes, 1900–1500 BCE.

center, particularly in bronze metallurgy and chariot warfare. The chariot-driving Shang kings of China and the Mycenaean princes of Greece, contemporaries at opposite ends of the ancient world at about 1500 BCE, shared a common technological debt to the LBA herders of the Eurasian steppes.

#### THE SRUBNAYA CULTURE: HERDING AND GATHERING IN THE WESTERN STEPPE

West of the Ural Mountains, the Potapovka and late Abashevo groups of the middle Volga region developed into the Pokrovka complex, dated about 1900–1750 BCE. Pokrovka was a proto-Srubnaya phase that rapidly developed directly into the Srubnaya (or Timber-Grave) culture (1800–1200 BCE). Srubnaya material culture spread as far west as the Dnieper valley. One of the most prominent features of the Srubnaya culture was the appearance of hundreds of small settlement sites, most of them containing just a few houses, across the northern steppe and the southern forest-steppe, from the Urals to the Dnieper. Although settlements had reappeared in a few places east of the Don River during the late Catacomb culture, 2400–2100 BCE, and were even more numerous in Ukraine west of the Don during the Mnogovalikovaya (MVK) period (2100–1800 BCE), the Srubnaya period was the first time since the Eneolithic that settlements appeared across the entire northern steppe zone from the Dnieper to the southern Urals and beyond into northern Kazakhstan.

The reason for this shift back to living in permanent homes is unclear. Most Srubnaya settlements were not fortified or defended. Most were small individual homesteads or extended family ranches rather than nucleated villages. The herding pattern seems to have been localized rather than migratory. During the Samara Valley Project, in 1999–2001, we studied the local Srubnaya herding pattern by excavating a series of Srubnaya herding camps that extended up a tributary stream valley, Peschanyi Dol, from the Srubnaya settlement at Barinovka, near the mouth of the valley on the Samara (figure 16.11). The largest herding camps (PD1 and 2) were those closest to the home settlement, within 4–6 km of Barinovka. Farther upstream the Srubnaya camps were smaller with fewer pottery sherds, and beyond about 10–12 km upstream from Barinovka we found no LBA herding camps at all, not even around the springs that fed the stream at its source, where there was plenty of water and good pastures. So the herding system seems to have been localized, like the new residence pattern.



*Figure 16.11* The Peschanyi Dol valley, a tributary of the Samara River, surveyed to find ephemeral camps in 1995–96. PD1, 2, and 3, were Srubnaya herding camps excavated in 2000. All numbered sites yielded at least one Srubnaya ceramic sherd. Barinovka was a larger Srubnaya settlement tested in

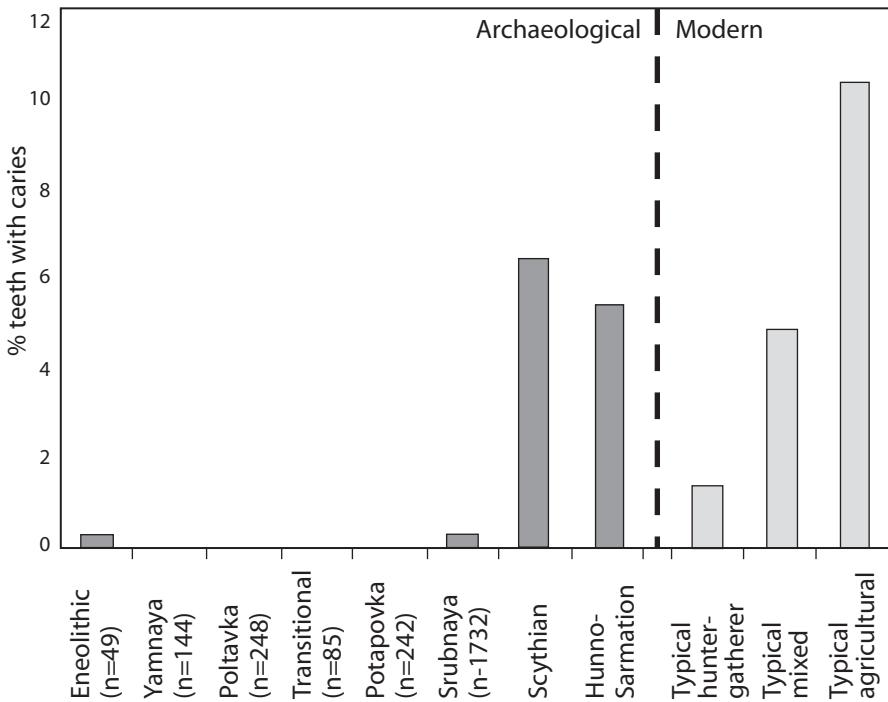
The Srubnaya economy in the middle Volga steppes does not seem to have required long-distance migrations.

One traditional explanation for the settling-down phenomenon is that this was when agriculture was widely adopted across the northern steppes.<sup>22</sup> But this explanation certainly does not apply everywhere. At the settlement of Krasnosamarskoe in the Samara River valley, where the dog sacrifice was found (chapter 15), a Pokrovka component (radiocarbon dated 1900–1800 BCE) and an early Srubnaya component (dated 1800–1700 BCE) were stratified within a single structure. In the Srubnaya period the structure probably was a well-house and woodshed where a variety of domestic tasks were conducted and food garbage was buried in pits. It was used during all seasons of the year. Anne Pike-Tay's analysis of seasonal bands in the roots of animal teeth established that the cattle and sheep were butchered in all seasons. But there was no agriculture. Laura Popova found no seeds, pollen, or phytoliths of cultivated cereals associated with the LBA occupation, only wild *Chenopodium* and *Amaranthus* seeds. The skeletons of 192 adults from twelve Srubnaya cemeteries in the Samara oblast were examined by Eileen Murray and A. Khokhlov. They showed almost no dental decay. The complete absence of caries usually is associated with a low-starch, low-carbohydrate diet, typical for foragers and quite atypical for bread eaters (figure 16.12). The dental evidence confirmed the botanical evidence. Bread was not eaten much, if at all, in the northern steppes.

In pits at Krasnosamarskoe we found an abundance of carbonized wild seeds, including *Chenopodium album* and *Amaranthus*. Modern wild *Chenopodium* (also known as goosefoot) is a weed that grows in dense stands that can produce seed yields in the range of 500–1000 kg/ha, about the same as einkorn wheat, which yields 645–835 kg/ha.<sup>23</sup> *Amaranthus* is equally prolific. With meat and milk from cattle, sheep, and horses, this was a sufficient diet. Although clear evidence of cereal agriculture has been found in Srubnaya settlements west of the Don in Ukraine, it is possible that agriculture was much less important east of the Don than has often been assumed. Herding and gathering was the basis for the northern steppe economy in at least some regions east of the Don as late as the LBA.<sup>24</sup>

---

Figure 16.11 (continued) 1996 but found to be badly disturbed by a historic settlement. Author's excavation. Bottom image is a Google Earth™ image, © 2006 Terra Metrics, 2006 Europa Technologies.



*Figure 16.12* Graph of the frequency of dental caries (cavities) in populations with different kinds of food economies (*right*), in Scythian and Sarmatian cemeteries in Tuva (*center*), and in prehistoric populations in the Samara oblast, middle Volga region (*left six bars*). Bread apparently was not part of the diet in the Samara oblast. After Murphy 2003; and Murphy and Khokhlov 2001.

So if agriculture does not provide an answer, then why did people settle down during the MBA/LBA transition in the northern steppes, including the earlier episode at Sintashta? As explained in chapter 15, climate change might have been the principal cause. A cool, arid climate affected the Eurasian steppes between about 2500–2000 BCE. This was the same event that struck Akkadian agriculture and weakened the Harappan civilization. The late MBA/early LBA settling-down phenomenon, including the earliest episodes at Sintashta and Arkaim, can be interpreted as a way to maintain control over the richest winter forage areas for herds, particularly if grazing animals were the principal source of food in an economy that, in many regions, did not include agriculture. Early LBA Krasnosamarskoe overlooked one of the largest marshes on the lower Samara River.

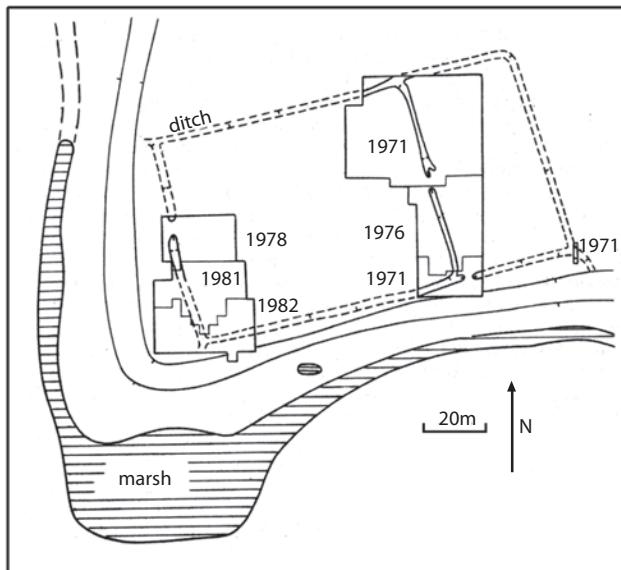
Some permanent settlements also developed near copper mines. Cattle forage was not the only critical resource in the northern steppes. Mining and bronze working became important industries across the steppes during the LBA. A vast Srubnaya mining center operated at Kargaly near Orenburg in the South Urals, and other enormous copper mines operated near Karaganda in central Kazakhstan. Smaller mining camps were established at many small copper outcrops, like the Srubnaya mining camp at Mikhailovka Ovsianka in the southern Samara oblast.<sup>25</sup>

#### EAST OF THE URALS, PHASE I: THE PETROVKA CULTURE

The first culture of the LBA east of the Urals was the Petrovka culture, an eastern offshoot of Sintashta dated about 1900–1750 BCE. Petrovka was so similar to Sintashta in its material culture and mortuary rituals that many archaeologists (including me) have used the combined term Sintashta-Petrovka to refer to both. But Petrovka ceramics show some distinctive variations in shape and decoration, and are stratified above Sintashta deposits at several sites, so it is clear that Petrovka grew out of and was generally later than Sintashta. The oldest Petrovka sites, like the type site, Petrovka II, were settlements on the Ishim River in the steppes of northern Kazakhstan (figure 16.13). The Petrovka culture probably absorbed some people who had roots in the older post-Botai horse-centered cultures of the Ishim steppes, like Sergeivka, but they were materially (and probably linguistically) almost invisible. Petrovka-style pottery then replaced Sintashta ceramics at several Sintashta fortified sites, as at Ust'ye, where the Sintashta settlement was burned and replaced by a Petrovka settlement built on a different plan. Petrovka graves were dug into older Sintashta kurgans at Krivoe Ozero and Kamenny Ambar.<sup>26</sup>

The settlement of Petrovka II was surrounded by a narrow ditch less than 1 m deep, perhaps for drainage. The twenty-four large houses had dug-out floors and measured from 6 by 10 m to about 8 by 18 m. They were built close together on a terrace overlooking the floodplain, a nucleated village pattern quite different from the scattered homesteads of the Srubnaya culture. Petrovka II was reoccupied by people who made classic Andronovo-horizon ceramics of both the Alakul and Federovo types, stratified above the Petrovka layer, and the Andronovo town was succeeded by a “final-LBA” settlement with Sargar ceramics. This stratified sequence made Petrovka II an important yardstick for the LBA chronology of the Kazakh steppes. Chariots continued to be buried in a few early Petrovka graves at Berlyk II and Krivoe Ozero, and many bone disk-shaped cheekpieces have

Petrovka settlement plan



1971 excavation detail



*Figure 16.13* The Petrovka settlement, type site for the Petrovka culture, ca. 1900–1750 BCE: (top) general plan of the original ditch around the settlement, with a later enlargement at the east end, after Zdanovich 1988, Figure 12; (bottom) detail of overlapping rebuilt house floors in the northeast corner of the original settlement, with new houses built over the original eastern ditch, after

come from Petrovka sites. During the Petrovka period, however, chariot burials gradually ceased, the size and number of mortuary animal sacrifices also declined, and large-scale Sintashta-type fortifications were no longer built around settlements in the northern steppes.

Petrovka settlements and kurgan cemeteries spread southward into the arid steppes of central Kazakhstan, and from there to Tugai on the Zeravshan, more than 1,200 km south of central Kazakhstan. Petrovka probably also was in touch with the Okunevo culture in the western Altai, the successor of late Afanasievo. The permanent nucleated settlements of the Petrovka culture do not resemble the temporary camps of nomadic herdsmen, so it is unlikely that the Petrovka economy depended on annual long-distance migrations. Early historic nomads, who did not live in permanent nucleated villages, wintered in the Syr Darya marshes and summered in the north Kazakh steppes, a cycle of annual movements that brought them to the doorstep of Central Asia civilizations each winter. But the Petrovka economy seems to have been less nomadic. If the Petrovka people did *not* engage in long-distance herd migrations, then their movement south to the Zeravshan was not an accidental by-product of annual herding patterns (as is often presumed) but instead was intentional, motivated by the desire for trade, loot, or glory. The later annual migration pattern does at least show that in the spring and fall it was possible to drive herds of animals across the intervening desert and semi-desert.<sup>27</sup>

Petrovka settlements commonly contained two-part furnaces, slag, and abundant evidence of copper smelting, like Sintashta settlements. But, unlike Sintashta, most Petrovka metal objects were made of tin-bronze.<sup>28</sup> A possible source for the tin in Petrovka tin-bronzes, in addition to the Zeravshan valley, was in the western foothills of the Altai Mountains. A remarkable shift occurred in the forest-steppe zone north of the Petrovka territory during the early Petrovka phase.

#### THE SEIMA-TURBINO HORIZON IN THE FOREST-STEPPE ZONE

The Seima-Turbino horizon marks the entry of the forest-steppe and forest-zone foragers into the cycle of elite competition, trade, and warfare that had erupted earlier in the northern steppes. The tin-bronze spears, daggers, and axes of the Seima-Turbino horizon were among the most

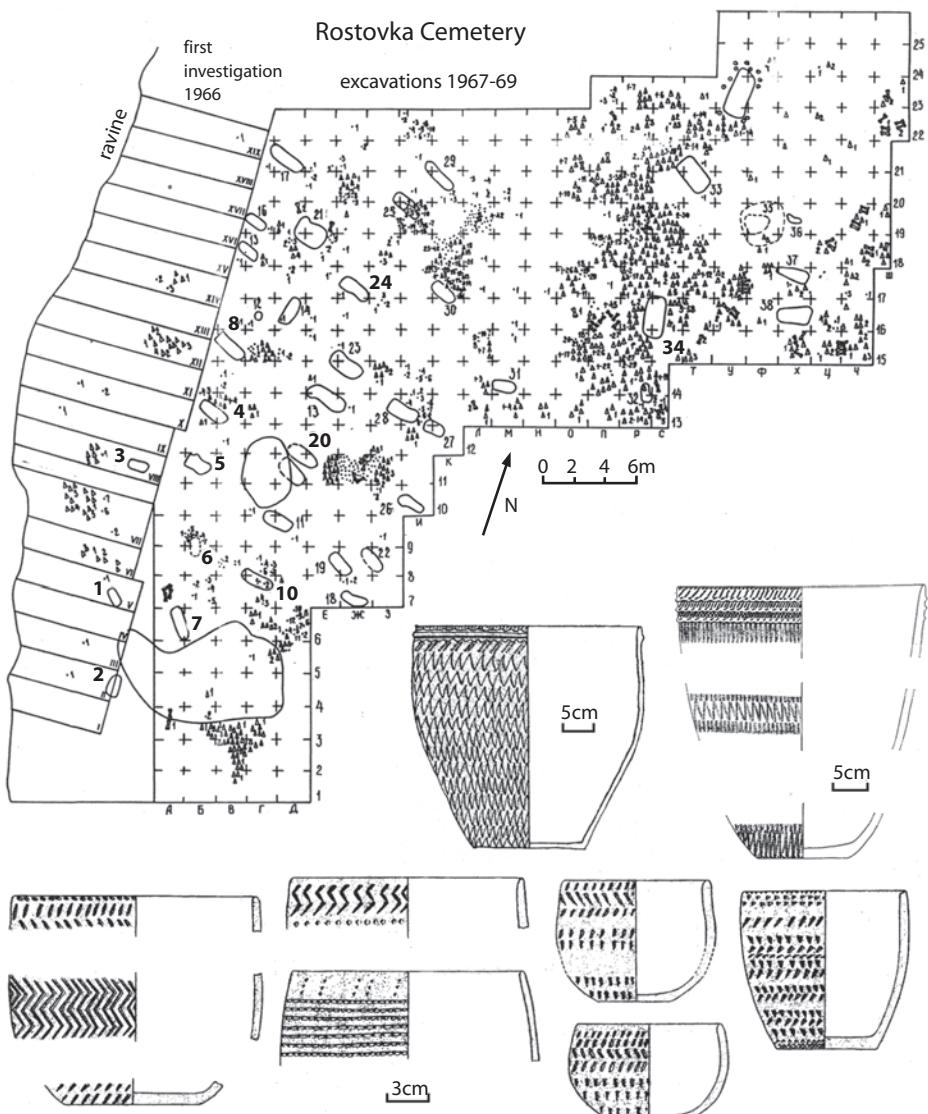
---

*Figure 16.13 (continued)* Maliutina 1991, Figure 14. The stratigraphic complexity of these settlements contributes to arguments about phases and chronology.

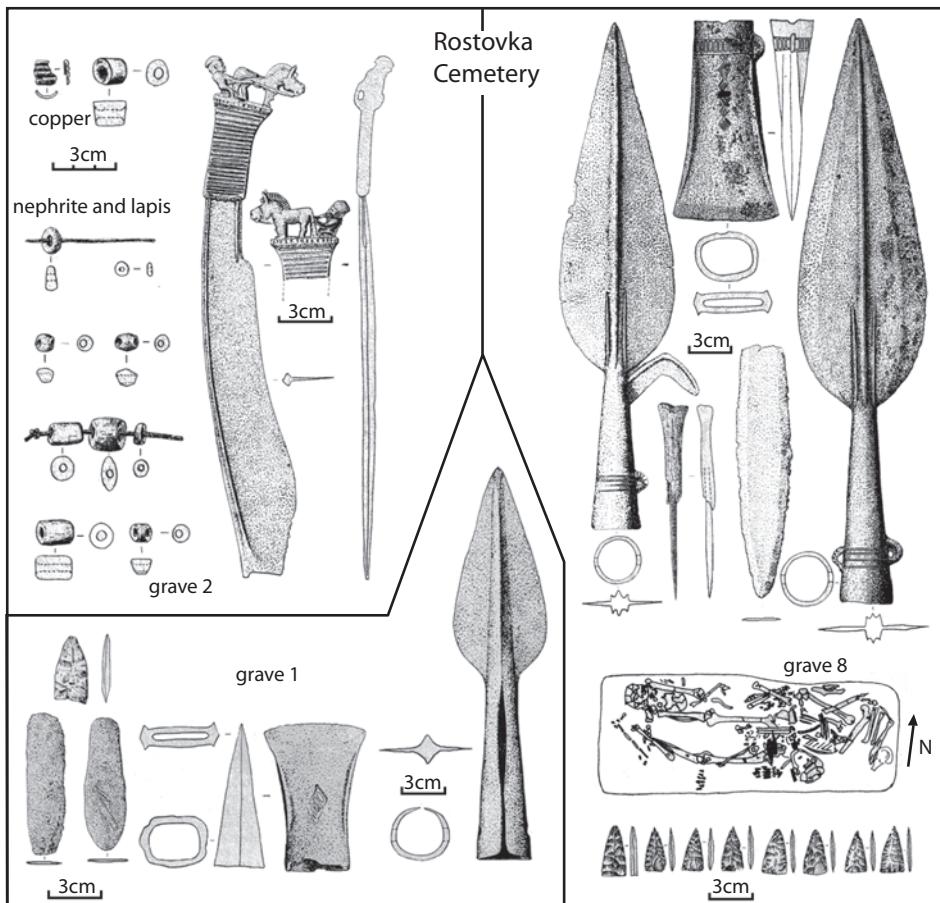
technically and aesthetically refined weapons in the ancient world, but they were made by forest and forest-steppe societies that in some places (Tashkovo II) still depended on hunting and fishing. These very high-quality tin-bronze objects first appeared among the Elunino and Krotovo cultures located on the upper and middle Irtysh and the upper Ob in the western foothills of the Altai Mountains, a surprisingly remote region for such a remarkable exhibition of metallurgical skill. But tin, copper, and gold ores all could be found on the upper Irtysh, near the confluence of the Irtysh and the Bukhtarta rivers about 600 km east of Karaganda. The exploitation of these ore sources apparently was accompanied by an explosion of new metallurgical skills.

One of the earliest and most important Seima-Turbino cemeteries was at Rostovka in the Omsk oblast on the middle Irtysh (figure 16.14). Although skeletal preservation was poor, many of the thirty-eight graves seem to have contained no human bones at all or just a few fragments of a skeleton. In the graves with whole bodies the skeleton was supine with the legs and arms extended. Grave gifts were offered both in the graves and in ritual deposits at the edge of graves. Both kinds of offerings included tin-bronze socketed spearheads, single-edged curved knives with cast figures on the pommel, and hollow-core bronze axes decorated with triangles and lozenges. Grave 21 contained bivalve molds for making all three of these weapon types. Offerings also included stemmed flint projectile points of the same types that appeared in Sintashta graves, bone plates pierced to make plate armor, and nineteen hundred sherds of Krotovo pottery (figure 16.14). One grave (gr. 2) contained a lapis lazuli bead from Afghanistan, probably traded through the BMAC, strung with beads of nephrite, probably from the Baikal region.<sup>29</sup>

Seima-Turbino metalsmiths were, with Petrovka metalsmiths, the first north of Central Asia to regularly use a tin-bronze alloy. But Seima-Turbino metalsmiths were unique in their mastery of lost-wax casting (for decorative figures on dagger handles) and thin-walled hollow-mold casting (for socketed spears and hollow axes). Socketed spearheads were made on Sintashta anvils by bending a bronze sheet around a socket form and then forging the seam (figure 16.15). Seima-Turbino socketed spearheads were made by pouring molten metal into a mold that created a seamless cast socket around a suspended core, making a hollow interior, a much more sophisticated operation, and easier to do with tin-bronze than with arsenical bronze. Axes were made in a similar way, tin-bronze with a hollow interior, cast around a suspended core. Lost-wax and hollow-mold casting methods probably were learned from the BMAC civilization, the only reasonably nearby source (perhaps through a skilled captive?).



*Figure 16.14* The Rostovka cemetery near Omsk, one of the most important sites of the Seima-Turbino culture. Graves are numbered. Black dots represent ceramics, metal objects, and other artifacts deposited above and beside the graves. All the pots conform to the Krotova type. After Matiushchenko and Sinitzyna 1988, figures 4, 81, 82, and 83.



*Figure 16.15* Grave lots from the Rostovka cemetery, graves 1, 2, and 8. The lost-wax cast figure of a man roping a horse and the hollow-mold casting of spears and axes were technical innovations probably learned from BMAC metalsmiths. Grave 1 contained beads made of both lapis lazuli from Afghanistan and nephrite probably from the near Lake Baikal. After Matiushchenko and Sinitsyna 1988, figures 6, 7, 17, and 18.

Beyond the western Altai/middle Irtysh core area the Seima-Turbino horizon was not a culture. It did not have a standard ceramic type, settlement type, or even a standard mortuary rite. Rather, Seima-Turbino metal-working techniques were adopted by emerging elites across the southern Siberian forest-steppe zone, perhaps in reaction to and competing with the Sintashta and Petrovka elites in the northern steppes. A

series of original and distinctive new metal types quickly diffused through the forest-steppe zone from the east to the west, appearing in late Abashevo and Chirkovskaya cemeteries west of the Urals almost at the same time that they first appeared east of the Urals, beginning about 1900 BCE. The rapidity and reach of this phenomenon in the forest zone is surprising. The new metal styles probably spread more by emulation than by migration, along with fast-moving political changes in the structure of power. Seima-Turbino spearheads, daggers, and axes were displayed at the Turbino cemetery in the forests of the lower Kama, southward up the Oka, and as far south as the Borodino hoard in Moldova, in the East Carpathian foothills. East of the Urals, most Seima-Turbino bronzes were tin-bronzes, and west of the Urals, they were mostly arsenical bronzes. The source of the tin was in the east, but the styles and methods of Seima-Turbino metallurgy were diffused across the forest-steppe and forest zones from the Altai to the Carpathians. The Borodino hoard contained a nephrite axe probably made of stone quarried near Lake Baikal. In the eastern direction, Seima-Turbino metal types (hollow-cast socketed spearheads with a side hook, hollow-cast axes) appeared also in sites on the northwestern edges of the evolving archaic Chinese state, probably through a network of trading trails that passed north of the Tien Shan through Dzungaria.<sup>30</sup>

The dating of the Seima-Turbino horizon has changed significantly in recent years. Similarities between Seima-Turbino socketed spearheads and daggers and parallel objects in Mycenaean tombs were once used to date the Seima-Turbino horizon to a period after 1650 BCE. It is clear now, however, that Mycenaean socketed spearheads, like studded disk cheek-pieces, were derived from the east and not the other way around. Seima-Turbino and Sintashta were partly contemporary, so Seima-Turbino probably began before 1900 BCE.<sup>31</sup> Seima-Turbino and Sintashta graves had the same kinds of flint projectile points. Sintashta forged socketed spearheads probably were the simpler predecessors of the more refined hollow-cast Seima-Turbino socketed spearheads. A hollow-cast spearhead of Seima-Turbino type was deposited in a Petrovka-culture chariot grave at Krivoe Ozero (k. 2, gr. 1); and a Sintashta bent and forged spearhead appeared in the Seima-Turbino cemetery at Rostovka (gr. 1) (see figure 16.15).

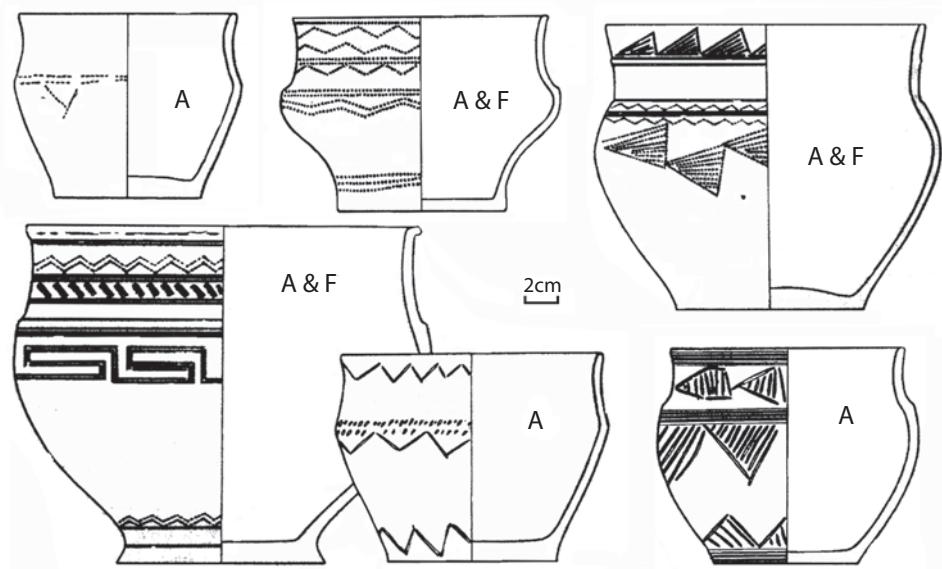
The metal-working techniques of the northern steppes (Sintashta and Petrovka) and the forest-steppe zone (Seima-Turbino) remained separate and distinct for perhaps one hundred to two hundred years. But by the beginning of the Andronovo period they merged, and some important

Seima-Turbino metal types, such as cast single-edged knives with a ring-pommel, became widely popular in Andronovo communities.

### EAST OF THE URALS, PHASE II: THE ANDRONOVO HORIZON

The Andronovo horizon was the principal LBA archaeological complex in the steppes east of the Urals, the sister of the Srubnaya horizon west of the Urals, between about 1800 and 1200 BCE. Andronovo sites extended from the Ural steppes eastward to the steppes on the upper Yenisei River in the Altai, and from the southern forest zone southward to the Amu Darya River in Central Asia. Andronovo contained two principal sub-groups, Alakul and Federovo. The earliest of these, the Alakul complex, appeared in some places by about 1900–1800 BCE. It grew directly out of the Petrovka culture by small modifications of ceramic decorations and vessel shapes. The Federovo style might have developed from a southern or eastern stylistic variant of Alakul, although some specialists insist that it had completely independent origins. Andronovo continued many of the customs and styles inherited through Sintashta and Petrovka: small family kurgan cemeteries, settlements containing ten to forty houses built close together, similar spear and dagger types, similar ornaments, and even the same decorative motifs on pottery: meanders, hanging triangles, “pine-tree” figures, stepped pyramids, and zig-zags. But chariots were no longer buried.

Alakul and Federovo are described as separate cultures within the Andronovo horizon, but to this observer, admittedly not an expert in the details of LBA ceramic typology, the Alakul and Federovo ceramic styles seem similar. Pot shapes varied only slightly (Federovo pots usually had a more indented, undercut lower profile) and decorative motifs also varied around common themes (some Federovo motifs were “italicized” or forward-slanted versions of Alakul motifs). Pots and potsherds of these two ceramic styles are found in the same sites from the Ural-Tobol steppes southeastward to central Kazakhstan, often in the same house and pit features, and in adjoining kurgans in the same cemeteries. Some pots are described as Alakul with Federovo elements, so the two varieties can appear on the same pot (figure 16.16). Alakul pottery is stratified beneath Federovo pottery in a few key features at some sites (at Novonikol’skoe and Petrovka II in the Ishim steppes and Atasu 1 in central Kazakhstan), but Federovo pottery has never been found stratified beneath Alakul. The earliest Alakul radiocarbon dates (1900–1700 BCE) are a little older than the earliest Federovo dates (1800–1600 BCE), so Alakul



*Figure 16.16* Andronovo pots that are described as typical Alkakul (A) or Alakul with Federovo traits (A+F) from the Priplodyi Log kurgan cemetery I on the Ui River, Chelyabinsk oblast, Russia. Traits of both styles can appear on the same pot. After Maliutina 1984, figure 4.

probably began a century or two earlier, although in many settlements the two are thoroughly mixed. Kurgans containing Federovo pots often had larger, more complex stone constructions around the grave and the dead were cremated, whereas kurgans with Alakul pots were simpler and the dead usually were buried in the flesh. Since the two ceramic styles occurred in the same settlements and cemeteries, and even in the same house and pit features, they cannot easily be interpreted as distinct ethnic groups.<sup>32</sup>

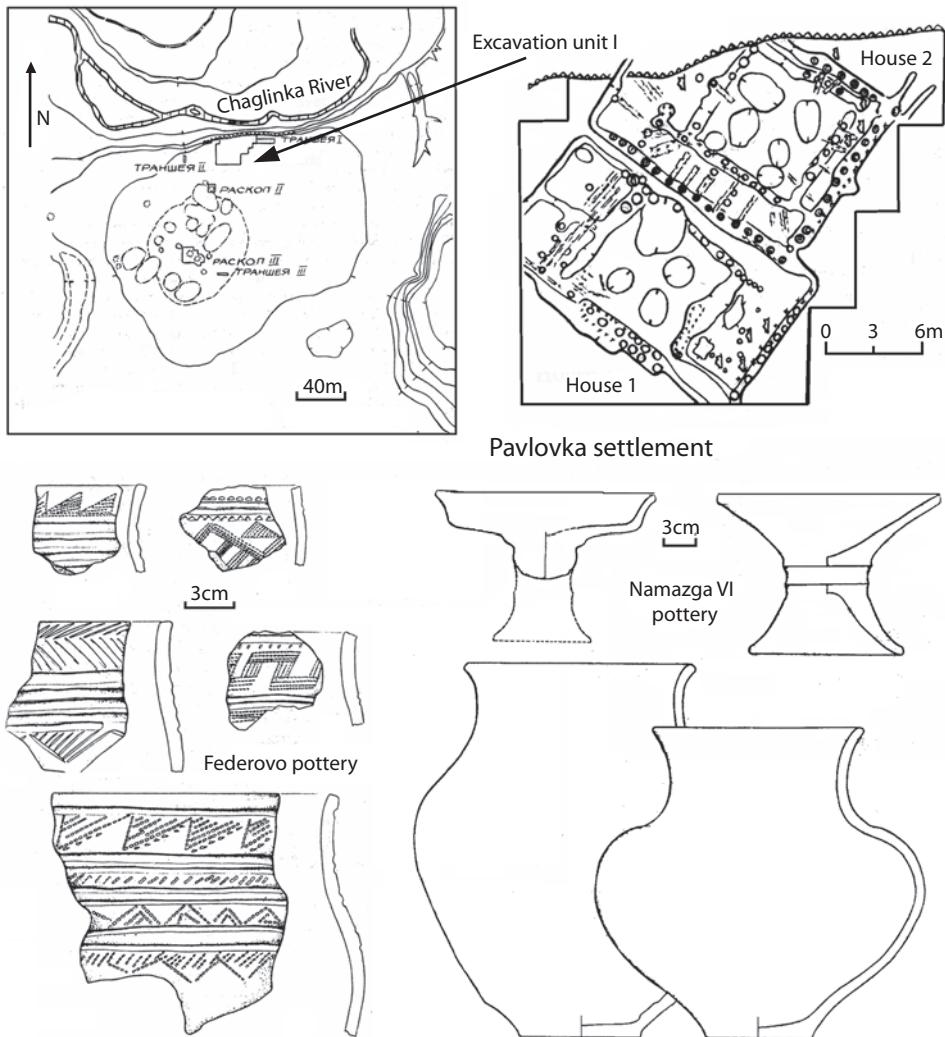
The spread of the Andronovo horizon represented the maturation and consolidation of an economy based on cattle and sheep herding almost everywhere in the grasslands east of the Urals. Permanent settlements appeared in every region, occupied by 50 to 250 people who lived in large houses. Wells provided water through the winter. Some settlements had elaborate copper-smelting ovens. Small-scale agriculture might have played a minor role in some places, but there is no direct evidence for it. In the northern steppes cattle were more important than sheep (cattle 40% of bones, sheep/goat 37%, horses 17% in the Ishim steppes), whereas in

central Kazakhstan there were more sheep than cattle, and more horses as well (sheep/goat 46%, cattle 29%, horse 24%).<sup>33</sup>

Although it is common in long-established tribal culture areas for a relatively homogeneous material culture to mask multiple languages, the link between language and material culture often is strong among the early generations of long-distance migrants. The source of the Andronovo horizon can be identified in an extraordinary burst of economic, military, and ritual innovations by a single culture—the Sintashta culture. Many of its customs were retained by its eastern daughter, the Petrovka culture. The language spoken in Sintashta strongholds very likely was an older form of the language spoken by the Petrovka and Andronovo people. Indo-Iranian and Proto-Iranian dialects probably spread with Andronovo material culture.

Most Andronovo metals, like Petrovka metals, were tin-bronzes. Andronovo miners mined tin in the Zeravshan and probably on the upper Irtysh. Andronovo copper mines were active in two principal regions: one was south of Karaganda near Uspenskyi, working malachite and azurite oxide ores; and the other was to the west in the southern Ulutau Hills near Dzhezkazgan, working sulfide ores. (Marked on figure 15.9.) One mine of at least seven known in the Dzhezkazgan region was 1,500 m long, 500 m wide, and 15 m deep. Ore was transported from the Uspenskyi mine to copper-smelting settlements such as Atasu 1, where excavation revealed three key-shaped smelting ovens with 4 m-long stone-lined air shafts feeding into two-level circular ovens. The Karaganda-region copper mines are estimated to have produced 30 to 50,000 metric tons of smelted copper during the Bronze Age.<sup>34</sup> The labor and facilities at these places suggest enterprises organized for export.

Trade with and perhaps looting raids into Central Asia left clear evidence surprisingly far north in the steppes. Wheel-made Namamzga VI pottery was found in the Andronovo settlement of Pavlovka, in northern Kazakhstan near Kokchetav, 2,000 km north of Bactria. It was 12% of the pottery on two house floors. The remainder was Andronovo pottery of the Federovo type.<sup>35</sup> The imported Central Asian pots were made with very fine white or red clay fabrics, largely undecorated, and in forms such as pedestaled dishes that were typical of Namazaga VI (figure 16.17). Pavlovka was a settlement of about 5 ha with both Petrovka and Federovo pottery. The Central Asian pottery is said to have been associated with the Federovo component.



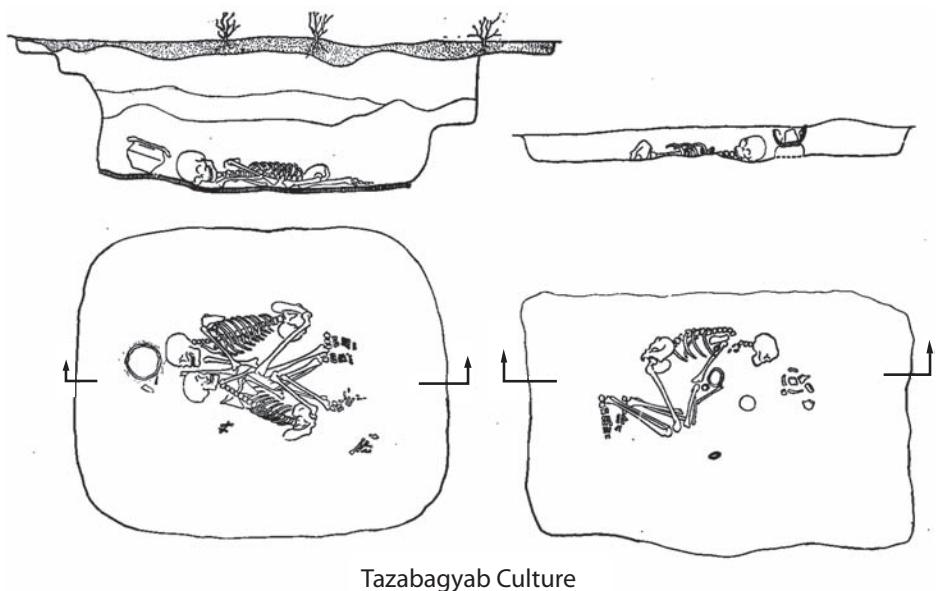
*Figure 16.17* Pavlovka, an Alakul-Federovo settlement in the Kokchetav region of northern Kazakhstan, with imported Namazga VI pottery constituting more than 10% of the sherds on two house floors. After Maliutina 1991, figures 4 and 5.

## PROTO-VEDIC CULTURES IN THE CENTRAL ASIAN CONTACT ZONE

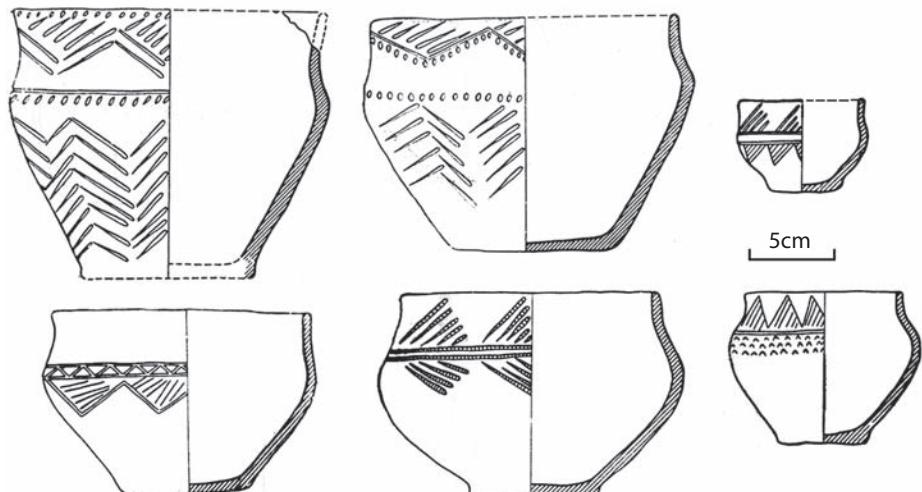
By about 1900 BCE Petrovka migrants had started to mine copper in the Zeravshan valley at Tugai. They were followed by larger contingents of Andronovo people who mined tin at Karnab and Mushiston. After 1800 BCE Andronovo mining camps, kurgan cemeteries, and pastoral camps spread into the middle and upper Zeravshan valley. Other Andronovo groups moved into the lower Zeravshan and the delta of the lower Amu Darya (now located in the desert east of the modern delta) and became settled irrigation farmers, known as the Tazabagyab variant of the Andronovo culture. They lived in small settlements of a few large dug-out houses, much like Andronovo houses; used Andronovo pottery and Andronovo-style curved bronze knives and twisted earrings; conducted in-settlement copper smelting as at many Andronovo settlements; but buried their dead in large flat-grave cemeteries like the one at Kokcha 3, with more than 120 graves, rather than in kurgan cemeteries (figure 16.18).<sup>36</sup>

About 1800 BCE the walled BMAC centers decreased sharply in size, each oasis developed its own types of pottery and other objects, and Andronovo-Tazabagyab pottery appeared widely in the Bactrian and Margian countryside. Fred Hiebert termed this the *post-BMAC* period to emphasize the scale of the change, although occupation continued at many BMAC strongholds and Namazga VI-style pottery still was made inside them.<sup>37</sup> But Andronovo-Tazabagyab coarse incised pottery occurred both within post-BMAC fortifications and in occasional pastoral camps located outside the mudbrick walls. Italian survey teams exposed a small Andronovo-Tazabagyab dug-out house southeast of the post-BMAC walled fortress at Takhirbai 3, and American excavations found a similar occupation outside the walls of a partly abandoned Gonur. By this time the people living just outside the crumbling walls and at least some of those now living inside were probably closely related. To the east, in Bactria, people making similar incised coarse ware camped atop the vast ruins (100 ha) of the Djarkutan city. Some walled centers such as Mollali-Tepe continued to be occupied but at a smaller scale. In the highlands above the Bactrian oases in modern Tajikistan, kurgan cemeteries of the Vaksh and Bishkent type appeared with pottery that mixed elements of the late BMAC and Andronovo-Tazabagyab traditions.<sup>38</sup>

Between about 1800 and 1600 BCE, control over the trade in minerals (copper, tin, turquoise) and pastoral products (horses, dairy, leather) gave the Andronovo-Tazabagyab pastoralists great economic power in the old



Tazabagyab Culture



*Figure 16.18* Graves of the Tazabagyab-Andronovo culture at the Kokcha 3 cemetery on the old course of the lower Amu-Darya River. Pottery like this was widespread in the final phase of occupation in the declining BMAC walled towns of Central Asia, 1700–1500 BCE. After Tolstov and Kes' 1960, figure 55.

BMAC oasis towns and strongholds, and chariot warfare gave them military control. Social, political, and even military integration probably followed. Eventually the simple incised pottery of the steppes gave way to new ceramic traditions, principally gray polished wares in Margiana and the Kopet Dag, and painted wares in Bactria and eastward into Tajikistan.

By 1600 BCE all the old trading towns, cities, and brick-built fortified estates of eastern Iran and the former BMAC region in Central Asia were abandoned. Malyan, the largest city on the Iranian plateau, was reduced to a small walled compound and tower occupied within a vast ruin, where elite administrators, probably representatives of the Elamite kings, still resided atop the former city. Pastoral economies spread across Iran and into Baluchistan, where clay images of riders on horseback appeared at Pirak about 1700 BCE. Chariot corps appeared across the Near East as a new military technology. An Old Indic-speaking group of chariot warriors took control of a Hurrian-speaking kingdom in north Syria about 1500 BCE. Their oaths referred to deities (Indra, Varuna, Mithra, and the Nasatyas) and concepts (*r'ta*) that were the central deities and concepts in the *Rig Veda*, and the language they spoke was a dialect of the Old Indic Sanskrit of the *Rig Veda*.<sup>39</sup> The Mitanni dynasts came from the same ethnolinguistic population as the more famous Old Indic-speakers who simultaneously pushed eastward into the Punjab, where, according to many Vedic scholars, the *Rig Veda* was compiled about 1500–1300 BCE. Both groups probably originated in the hybrid cultures of the Andronovo/Tazabagyab/ coarse-incised-ware type in Bactria and Margiana.<sup>40</sup>

The language of the *Rig Veda* contained many traces of its syncretic origins. The deity name *Indra* and the drug-deity name *Soma*, the two central elements of the religion of the *Rig Veda*, were non-Indo-Iranian words borrowed in the contact zone. Many of the qualities of the Indo-Iranian god of might/victory, Verethraghna, were transferred to the adopted god Indra, who became the central deity of the developing Old Indic culture.<sup>41</sup> Indra was the subject of 250 hymns, a quarter of the *Rig Veda*. He was associated more than any other deity with *Soma*, a stimulant drug (perhaps derived from *Ephedra*) probably borrowed from the BMAC religion. His rise to prominence was a peculiar trait of the Old Indic speakers. Indra was regarded in later Avestan Iranian texts as a minor demon. Iranian dialects probably developed in the northern steppes among Andronovo and Srubnaya people who had kept their distance from the southern civilizations. Old Indic languages and rituals developed in the contact zone of Central Asia.<sup>42</sup>

*Loan Words Borrowed into Indo-Iranian and Vedic Sanskrit*

The Old Indic of the *Rig Veda* contained at least 383 non-Indo-European words borrowed from a source belonging to a different language family. Alexander Lubotsky has shown that common Indo-Iranian, the parent of both Old Indic and Iranian, probably had already borrowed words from the *same* non-Indo-European language that later enriched Old Indic. He compiled a list of 55 non-Indo-European words that were borrowed into common Indo-Iranian *before* Old Indic or Avestan evolved, and then later were inherited into one or both of the daughters from common Indo-Iranian. The speakers of common Indo-Iranian were in touch with and borrowed terms from the *same foreign language group* that later was the source from which Old Indic speakers borrowed even more terms. This discovery carries significant implications for the geographic locations of common Indo-Iranian and formative Old Indic—they must have been able to interact with the same foreign-language group.

Among the fifty-five terms borrowed into common Indo-Iranian were the words for bread (*\*nagna-*), ploughshare (*sp<sup>b</sup>āra*), canal (*\*iavīā*), brick (*\*išt(i)a-*), camel (*\*Huštra-*), ass (*\*k<sup>b</sup>ara-*) sacrificing priest (*\*ucīg-*), soma (*\*anču-*), and Indra (*\*indra-*). The BMAC fortresses and cities are an excellent source for the vocabulary related to irrigation agriculture, bricks, camels, and donkeys; and the phonology of the religious terms is the same, so probably came from the same source. The religious loans suggest a close cultural relationship between some people who spoke common Indo-Iranian and the occupants of the BMAC fortresses. These borrowed southern cults might possibly have been one of the features that distinguished the Petrovka culture from Sintashta. Petrovka people were the first to migrate from the northern steppes to Tugai on the northern edge of Central Asia.

Lubotsky suggested that Old Indic developed as a vanguard language south of Indo-Iranian, closer to the source of the loans. The archaeological evidence supports Lubotsky's suggestion. The earliest Old Indic dialects probably developed about 1800–1600 BCE in the contact zone south of the Zeravshan among northern-derived immigrants who were integrated with and perhaps ruled over the declining fortunes of the post-BMAC citadels. They retained a decidedly pastoral set of values. In the *Rig Veda* the clouds were compared to dappled cows full of milk; milk and butter were the symbols of prosperity; milk, butter, cattle, and horses were the proper offerings to the gods; Indra was compared to a mighty bull; and wealth was counted in fat cattle and swift horses. Agricultural products

were never offered to the gods. The people of the *Rig Veda* did not live in brick houses and had no cities, although their enemies, the *Dasyus*, did live in walled strongholds. Chariots were used in races and war; the gods drove chariots across the sky. Almost all important deities were masculine. The only important female deity was Dawn, and she was less powerful than Indra, Varuna, Mithra, Agni, or the Divine Twins. Funerals included both cremation (as in Federovo graves) and inhumation (as in Andronovo and Tazabagyab graves). Steppe cultures are an acceptable source for all these details of belief and practice, whereas the culture of the BMAC, with its female deity in a flounced skirt, brick fortresses, and irrigation agriculture, clearly is not.

During the initial phase of contact, the Sintashta or the Petrovka cultures or both borrowed some vocabulary and rituals from the BMAC, accounting for the fifty-five terms in common Indo-Iranian. These included the drug *soma*, which remained in Iranian ritual usage as *haoma*. In the second phase of contact, the speakers of Old Indic borrowed much more heavily from the same language when they lived in the shadows of the old BMAC settlements and began to explore southward into Afghanistan and Iran. Archaeology shows a pattern quite compatible with that suggested by the linguistic evidence.

#### THE STEPPES BECOME A BRIDGE ACROSS EURASIA

The Eurasian steppe is often regarded as a remote and austere place, poor in resources and far from the centers of the civilized world. But during the Late Bronze Age the steppes became a bridge between the civilizations that developed on the edges of the continent in Greece, the Near East, Iran, the Indian subcontinent, and China. Chariot technology, horses and horseback riding, bronze metallurgy, and a strategic location gave steppe societies an importance they never before had possessed. Nephrite from Lake Baikal appeared in the Carpathian foothills in the Borodino hoard; horses and tin from the steppes appeared in Iran; pottery from Bactria appeared in a Federovo settlement in northern Kazakhstan; and chariots appeared across the ancient world from Greece to China. The road from the steppes to China led through the eastern end of the Tarim Basin, where desert-edge cemeteries preserved the dessicated mummies of brown-haired, white-skinned, wool-wearing people dated as early as 1800 BCE. In Gansu, on the border between China and the Tarim Basin, the Qijia culture acquired horses, trumpet-shaped earrings, cast bronze ring-pommel

single-edged knives and axes in steppe styles between about 2000 and 1600 BCE.<sup>45</sup> By the time the first Chinese state emerged, beginning about 1800 BCE, it was exchanging innovations with the West. The Srubnaya and Andronovo horizons had transformed the steppes from a series of isolated cultural ponds to a corridor of communication. That transformation permanently altered the dynamics of Eurasian history.

## CHAPTER SEVENTEEN



### Words and Deeds

The Indo-European problem can be solved today because archaeological discoveries and advances in linguistics have eaten away at problems that remained insoluble as recently as fifteen years ago. The lifting of the Iron Curtain after 1991 made the results of steppe research more easily available to Western scholars and created new cooperative archaeological projects and radiocarbon dating programs. Linguists like Johanna Nichols, Sarah Thomason, and Terrence Kaufman came up with new ways of understanding language spread and convergence. The publication of the Khvalynsk cemetery and the Sintashta chariot burials revealed unsuspected richness in steppe prehistory. Linguistic and archaeological discoveries now converge on the probability that Proto-Indo-European was spoken in the Pontic-Caspian steppes between 4500 and 2500 BCE, and alternative possibilities are increasingly difficult to square with new evidence. Gimbutas and Mallory preceded me in arguing this case. I began this book by trying to answer questions that still bothered many reasonable observers.

One question was whether prehistoric language borders could be detected in prehistoric material culture. I suggested that they were correlated at persistent frontiers, a generally rare phenomenon that was surprisingly common among the prehistoric cultures of the Pontic-Caspian steppes. Another problem was the reluctance of Western archaeologists and the overenthusiasm of Eastern European archaeologists to use migration as an explanation for prehistoric culture change, a divergence in approach that produced Eastern interpretations that Western archaeologists would not take seriously. I introduced models from demographics, sociology, and anthropology that describe how migration works as a predictable, regular human behavior in an attempt to bring both sides to the middle. The most divisive problem was the absence of convincing evidence indicating when horse domestication and horseback riding began. Bit wear might settle the issue through the presence or absence of a clear riding-related pathology

on horse teeth. A separate but related debate swirled around the question of whether pastoral nomadism was possible as early as the Yamnaya horizon, or if it depended on later horseback riding, which in this argument only began in the Iron Age; or perhaps it depended on state economies, which also appeared on the steppe border during the Iron Age. The Samara Valley Project examined the botanical and seasonal aspects of a Bronze Age steppe pastoral economy and found that it did not rely on cultivated grain even in year-round permanent settlements. Steppe pastoralism was entirely self-sustaining and independent in the Bronze Age; wild seed plants were plentiful, and wild seeds were eaten where grain was not cultivated. Pastoral nomadism did not depend for its food supply on Iron Age states. Finally, the narrative culture history of the western steppes was impenetrable to most Western linguists and archaeologists. Much of this book is devoted to my efforts to cut a path through the tangle of arguments about chronology, culture groups, origins, migrations, and influences. I have tried to reduce my areas of ignorance about steppe archaeology, but am mindful of the few years I spent doing federally funded archaeology in Massachusetts, less than half the size of the single Samara oblast on the Volga, and how we all thought it an impossible task to try to learn the archaeology of Massachusetts *and* neighboring Rhode Island—one-tenth the size of Samara oblast. Nevertheless, I have found a path that makes sense through what I have read and seen. Debate will continue on all these subjects, but I sense that a chord is emerging from the different notes.

### THE HORSE AND THE WHEEL

Innovations in transportation technology are among the most powerful causes of change in human social and political life. The introduction of the private automobile created suburbs, malls, and superhighways; transformed heavy industry; generated a vast market for oil; polluted the atmosphere; scattered families across the map; provided a rolling, heated space in which young people could escape and have sex; and fashioned a powerful new way to express personal status and identity. The beginning of horseback riding, the invention of the heavy wagon and cart, and the development of the spoke-wheeled chariot had cumulative effects that unfolded more slowly but eventually were equally profound. One of those effects was to transform Eurasia from a series of unconnected cultures into a single interacting system. How that happened is a principal focus of this book.

Most historians think of war when they begin to list the changes caused by horseback riding and the earliest wheeled vehicles. But horses were first

domesticated by people who thought of them as food. They were a cheap source of winter meat; they could feed themselves through the steppe winter, when cattle and sheep needed to be supplied with water and fodder. After people were familiar with horses as domesticated animals, perhaps after a relatively docile male bloodline was established, someone found a particularly submissive horse and rode on it, perhaps as a joke. But riding soon found its first serious use in the management of herds of domesticated cattle, sheep, and horses. In this capacity alone it was an important improvement that enabled fewer people to manage larger herds and move them more efficiently, something that really mattered in a world where domesticated animals were the principal source of food and clothing. By 4800–4600 BCE horses were included with obviously domesticated animals in human funeral rituals at Khvalysnk on the middle Volga.

By about 4200–4000 BCE people living in the Pontic-Caspian steppes probably were beginning to ride horses to advance to and retreat from raids. Once they began to ride, there was nothing to prevent them from riding into tribal conflicts. Organic bits functioned perfectly well, Eneolithic steppe horses were big enough to ride (13–14 hands), and the leaders of steppe tribes began to carry stone maces as soon as they began to keep herds of cattle and sheep, around 5200–4800 BCE. By 4200 BCE people had become more mobile, their single graves emphasized individual status and personal glory unlike the older communal funerals, high-status graves contained stone maces shaped like horse heads and other weapons, and raiding parties migrated hundreds of kilometers to enrich themselves with Balkan copper, which they traded or gifted back to their relatives in the Dnieper-Azov steppes. The collapse of Old Europe about 4200–4000 BCE probably was at least partly their doing.

The relationship between mounted steppe pastoralists and sedentary agricultural societies has usually been seen by historians as either violent, like the Suvorovo confrontation with Old Europe, or parasitic, or both. “Barbaric” pastoral societies, hungry for grain, metals, and wealth, none of which they could produce themselves, preyed upon their “civilized” neighbors, without whom they could not survive. But these ideas are inaccurate and incomplete even for the historical period, as the Soviet ethnographer Sergei Vainshtein, the Western historian Nicola DiCosmo, and our own botanical studies have shown. Pastoralism produced plenty of food—the average nomad probably ate better than the average agricultural peasant in Medieval China or Europe. Steppe miners and craftsmen mined their own abundant ores and made their own metal tools and weapons; in fact, the enormous copper mines of Russia and Kazakhstan and the tin mines

of the Zeravshan show that the Bronze Age civilizations of the Near East depended on *them*. For the prehistoric era covered in this book, any model based on relationships between the militarized nomads of the steppes and the medieval civilizations of China or Persia is anachronistic. Although the steppe societies of the Suvorovo-Novodanilovka period did seem to prey upon their neighbors in the lower Danube valley, they were clearly more integrated and apparently had peaceful relationships with their Cucuteni-Tripolye neighbors at the same time. Maikop traders seem to have visited steppe settlements on the lower Don and even perhaps brought weavers there. The institutions that regulated peaceful exchange and cross-cultural relationships were just as important as the institution of the raid.

The reconstructed Proto-Indo-European vocabulary and comparative Indo-European mythology reveal what two of those important integrative institutions were: the oath-bound relationship between patrons and clients, which regulated the reciprocal obligations between the strong and the weak, between gods and humans; and the guest-host relationship, which extended these and other protections to people outside the ordinary social circle. The first institution, legalizing inequality, probably was very old, going back to the initial acceptance of the herding economy, about 5200–5000 BCE, and the first appearance of pronounced differences in wealth. The second might have developed to regulate migrations into unregulated geographic and social space at the beginning of the Yamnaya horizon.

When wheeled vehicles were introduced into the steppes, probably about 3300 BCE, they again found their first use in the herding economy. Early wagons and carts were slow, solid-wheeled vehicles probably pulled by oxen and covered by arched roofs made of reed mats plaited together, perhaps originally attached to a felt backing. Yamnaya-era graves often contain remnants of reed mats with other decayed organic material. On some occasions the mats were painted in red, black, and white stripes and curved designs, certainly at funerals. Wagons permitted herders to migrate with their herds into the deep steppes between the river valleys for weeks or months at a time, relying on the tents, food, and water carried in their wagons. Even if the normal annual range of movement was less than 50 km, which seems likely for Yamnaya herders, the combination of bulk wagon transport with rapid horseback transport revolutionized steppe economies, opening the majority of the Eurasian steppe zone to efficient exploitation. The steppes, largely wild and unused before, were domesticated. The Yamnaya horizon exploded across the Pontic-Caspian steppes about 3300 BCE. With it probably went Proto-Indo-European, its dialects

scattering as its speakers moved apart, their migrations sowing the seeds of Germanic, Baltic, Slavic, Italic, Celtic, Armenian, and Phrygian.

The chariot, the first wheeled vehicle designed entirely for speed, first appeared in the graves of the Sintashta culture, in the southern Ural steppes, about 2100 BCE. It was meant to intimidate. A chariot was incredibly difficult to build, a marvel of carpentry and bent-wood joinery. It required a specially trained team of fast, strong horses. To drive it through a turn, you had to rein each horse independently while keeping a backless, bouncing car level by leaning your weight into each bounce. It was even more difficult to throw a javelin accurately at a target while driving a speeding chariot, but the evidence from the Sintashta chariot graves suggests that this is precisely what they did. Only men with a lot of time and resources, as well as balance and courage, could learn to fight from a chariot. When a squadron of javelin-hurling chariot warriors wheeled onto the field of battle, supported by clients and supporters on foot and horseback with axes, spears, and daggers, it was a new, lethal style of fighting that had never been seen before, something that even urban kings soon learned to admire.

This heroic world of chariot-driving warriors was dimly remembered in the poetry of the *Iliad* and the *Rig Veda*. It was introduced to the civilizations of Central Asia and Iran about 2100 BCE, when exotic Sintashta or Petrovka strangers first appeared on the banks of the Zeravshan, probably bouncing along on the backs of the new kinds of equids from the north. At first, this odd way of moving around probably was amusing to the local people of Sarazm and Zaman Baba. Very soon, however, both places were abandoned. Between 2000 and 1800 BCE first Petrovka and then Alakul-Andronovo groups settled in the Zeravshan valley and began mining copper and tin. Horses and chariots appeared across the Near East, and the warfare of cities became dependent, for the first time, on well-trained horses. The Old Indic religion probably emerged among northern-derived immigrants in the contact zone between the Zeravshan and Iran as a syncretic mixture of old Central Asian and new Indo-European elements. From this time forward the people of the Eurasian steppes remained directly connected with the civilizations of Central Asia, South Asia, and Iran, and, through intermediaries, with China. The arid lands that occupied the center of the Eurasian continent began to play a role in transcontinental economies and politics.

Jared Diamond, in *Guns, Germs, and Steel*, suggested that the cultures of Eurasia enjoyed an environmental advantage over those of Africa or the Americas partly because the Eurasian continent is oriented in an east-west direction, making it easier for innovations like farming, herding, and

wheeled vehicles to spread rapidly between environments that were basically similar because they were on about the same latitude.<sup>1</sup> But persistent cultural borders like the Ural frontier delayed the transmission of those innovations by thousands of years even within the single ecological zone of the steppes. A herding economy was accepted on the middle Ural River, near the headwaters of the Samara River, by 4800 BCE. Hunters and gatherers in the neighboring steppes of northern Kazakhstan, at the same latitude, refused domesticated cattle and sheep for the next two thousand years (although they did begin to ride horses by 3700–3500 BCE). The potential geographic advantage Diamond described was frustrated for millennia, not a short time, by human distrust of foreign ways of doing things and admiration for the familiar ways. This tendency was hyper-developed when two very different cultures were brought into contact through long-distance migrations or at an ecological border. In the case of the Ural frontier, the Khvalynian Sea separated the populations east and west of the Ural Mountains for millennia, and the saline desert-steppe that replaced it (chapter 8) probably remained a significant ecological barrier for pedestrian foragers. Places like the Ural River frontier became borders where deep-rooted, intransigent traditions of opposition persisted.

These long-lasting, robust kinds of frontiers seem to have been rare in the prehistoric world of tribal politics. We have grown accustomed to them now only because the modern nation-state has made it the standard kind of border everywhere around the world, encouraging patriotism, jingoism, and the suspicion of other nations across sharply defined boundaries. In the tribal past, the long-term survival of sharp, bundled oppositions was unusual. The Pontic-Caspian steppes, however, witnessed an unusual number of persistent tribal frontiers because sharp environmental ecotones ran across it and it had a complex history of long-distance migrations, two important factors in the creation and maintenance of such frontiers.

#### ARCHAEOLOGY AND LANGUAGE

Indo-European languages replaced non-Indo-European languages in a multi-staged, uneven process that continues today, with the worldwide spread of English. No single factor explains every event in that complicated and drawn-out history—not race, demographics, population pressure, or imagined spiritual qualities. The three most important steps in the spread of Indo-European languages in the last two thousand years were the rise of the Latin-speaking Roman Empire (an event almost prevented by Hannibal); the expansion of Spanish, English, Russian, and French

colonial powers in Asia, America, and Africa; and the recent triumph of the English-speaking Western capitalist trade system, in which American-business English has piggybacked onto British-colonial English. No historian would suggest that these events shared a single root cause. If we can draw any lessons about language expansion from them, it is perhaps only that an initial expansion can make later expansions easier (the *lingua franca* effect), and that language generally follows military and economic power (the *elite dominance* effect, so named by Renfrew). The earliest Indo-European expansions described in this book laid a foundation of sorts for later expansions by increasing the territorial extent of the Indo-European languages, but their continued spread never was inevitable, and each expansion had its own local causes and effects. These local events are much more important and meaningful than any imagined spiritual cause.

It is not likely that the initial spread of the Proto-Indo-European dialects into regions outside the Pontic-Caspian steppes was caused primarily by an organized invasion or a series of military conquests. As I suggested in chapter 14, the initial spread of Proto-Indo-European dialects probably was more like a franchising operation than an invasion. At least a few steppe chiefs must have moved into each new region, and their initial arrival might well have been accompanied by cattle raiding and violence. But equally important to their ultimate success were the advantages they enjoyed in institutions (patron-client systems and guest-host agreements that incorporated outsiders as individuals with rights and protections) and perhaps in the public performances associated with Indo-European rituals. Their social system was maintained by myths, rituals, and institutions that were adopted by others, along with the poetic language that conveyed their prayers to the gods and ancestors. Long after the genetic imprint of the original immigrant chiefs faded away, the system of alliances, obligations, myths, and rituals that they introduced was still being passed on from generation to generation. Ultimately the last remnant of this inheritance is the expanding echo of a once-shared language that survives as the Indo-European language family.

Understanding the people who lived before us is difficult, particularly the people who lived in the prehistoric tribal past. Archaeology throws a bright light on some aspects of their lives but leaves much in the dark. Historical linguistics can illuminate a few of those dark corners. But the combination of prehistoric archaeology with historical linguistics has a bad history. The opportunities for imaginative fantasies of many kinds, both innocent and malevolent, seem dangerously increased when these two very different kinds of evidence are mixed. There is no way to stop

that from happening—as Eric Hobsbawm once remarked, historians are doomed to provide the raw material for bigotry and nationalism.<sup>2</sup> But he did not let that stop him from doing history.

For Indo-European archaeology, the errors of the past cannot be repeated as easily today. When the nineteenth-century fantasy of the Aryans began there were no material remains, no archaeological findings, to constrain the imagination. The Aryans of Madison Grant were concocted from sparse linguistic evidence (and even that was twisted to his purpose), a large dose of racism, a cover of ideals derived from the Classical literature of Greece and Rome, and the grim zero-sum politics of social Darwinism. Archaeology really played no role. The scattered archaeological discoveries of the first half of the twentieth century could still be forced into this previously established imaginary mold. But that is not so easy today. A convincing narrative about the speakers of Proto-Indo-European must today be pegged to a vast array of archaeological facts, and it must remain un-contradicted by the facts that stand outside the chosen narrative path. I have used a lot of archaeological detail in this account, because the more places a narrative is pegged to the facts, and the more different kinds of facts from different sources are employed as pegs, the less likely it is that the narrative is false. As both the density of the archaeological facts and the quality of the linguistic evidence improve, advances in each field should act as independent checks on the worst abuses. Although I have used linguistic reconstructions for which there is little direct archaeological evidence (importantly patron-client and guest-host relationships), at least both would be compatible with the kinds of societies indicated by the archaeological evidence.

On the positive side, the combination of archaeological evidence and the reconstructed Proto-Indo-European vocabulary can reveal entirely new kinds of information about the prehistoric past. That promise keeps pushing the project forward both for linguists and archaeologists. At many critical points the interpretations presented here have been guided by institutions, rituals, and words that I found in reconstructed Indo-European and applied to archaeological settings. But I have barely scratched the surface of what might be accomplished by pulling material out of Proto-Indo-European and using it as a lens through which to examine archaeological evidence. Reciprocally, archaeological data add real-life complexities and contradictions to the idealized Indo-European social world of the linguists. We might not be able to retrieve the names or the personal accomplishments of the Yamnaya chiefs who migrated into the Danube valley around 3000 BCE, but, with the help of reconstructed

Proto-Indo-European language and mythology, we can say something about their values, religious beliefs, initiation rituals, kinship systems, and the political ideals they admired. Similarly, when we try to understand the personal, human motivation for the enormous animal sacrifices that accompanied the funerals of Sintashta chiefs around 2000 BCE, reading the *Rig Veda* gives us a new way of understanding the value attached to public generosity (RV 10.117):

That man is no friend who does not give of his own nourishment to his friend, the companion at his side. Let the friend turn away from him; this is not his dwelling-place. Let him find another man who gives freely, even if he be a stranger. Let the stronger man give to the man whose need is greater; let him gaze upon the lengthening path. For riches roll like the wheels of a chariot, turning from one to another.<sup>3</sup>

Archaeologists are conscious of many historical ironies: wooden structures are preserved by burning, garbage pits survive longer than temples and palaces, and the decay of metals leads to the preservation of textiles buried with them. But there is another irony rarely appreciated: that in the invisible and fleeting sounds of our speech we preserve for a future generation of linguists many details of our present world.

## APPENDIX

### Author's Note on Radiocarbon Dates

All dates in this book are given as BCE (Before the Common Era) and CE (Common Era), the international equivalent of BC and AD.

All BCE dates in this book are based on calibrated radiocarbon dates. Radiocarbon dates measure the time that has passed since an organic substance (commonly wood or bone) died, by counting the amount of  $^{14}\text{C}$  that remains in it. Early radiocarbon scientists thought that the concentration of  $^{14}\text{C}$  in the atmosphere, and therefore in all living things, was a constant, and they also knew that the decay rate was a constant; these two factors established the basis for determining how long the  $^{14}\text{C}$  in a dead organic substance had been decaying. But later investigations showed that the concentration of  $^{14}\text{C}$  in the atmosphere varied, probably with sunspot activity. Organisms that lived at different times had different amounts of  $^{14}\text{C}$  in their tissues, so the baseline for counting the amount of  $^{14}\text{C}$  in the tissues moved up and down with time. This up-and-down variation in  $^{14}\text{C}$  concentrations has been measured in tree rings of known age taken from oaks and bristlecone pines in Europe and North America. The tree-ring sequence is used to calibrate radiocarbon dates or, more precisely, to convert raw radiocarbon dates into real dates by correcting for the initial variation in  $^{14}\text{C}$  concentrations as measured in a continuous sequence of annual tree rings. Uncalibrated radiocarbon dates are given here with the designation BP (before present); calibrated dates are given as BCE. Calibrated dates are “real” dates, measured in “real” years. The program used to convert BP to BCE dates is OxCal, which is accessible free for anyone at the website of the Oxford Radiocarbon Accelerator Unit.

Another kind of calibration seems to be necessary for radiocarbon dates taken on human bones, *if the humans ate a lot of fish*. It has long been recognized that in salt-water seas, organic substances like shell or fish bones absorb old carbon that is in solution in the water, which makes radiocarbon dates on shell and fish come out too old. This is called the “reservoir effect” because seas act as a reservoir of old carbon. Recent studies have indicated that the same problem can affect organisms that lived in fresh water, and most important among these were fish. Fish absorb old carbon in solution in fresh water, and people who eat a lot of fish will digest that old carbon

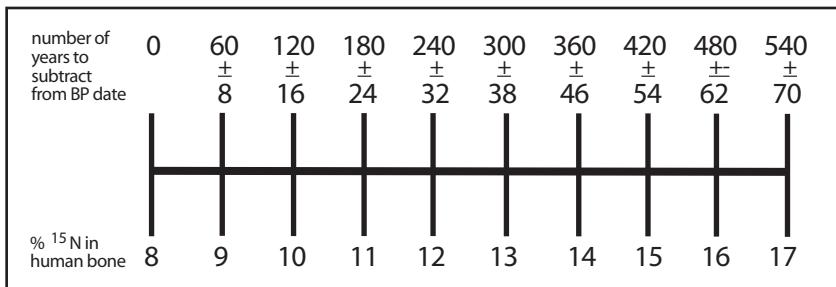


Figure A1. A proposed linear correlation between the % of  $^{15}\text{N}$  in dared human bone (bottom) and the number of radiocarbon years that should be subtracted from radiocarbon dares (top) before they are calibrated.

and use it to build their bones. Radiocarbon dates on their bones will come out too old. Dates measured on charcoal or the bones of horses and sheep are not affected, because wood and grazing animals do not absorb carbon directly from water like fish do, and they do not eat fish. Dates on human bone can come out centuries older than dates measured on animal bone or charcoal *taken from the same grave* (this is how the problem was recognized) if the human ate a lot of fish. The size of the error depends on how much fish the human ate and how much old carbon was in solution in the groundwater where he or she went fishing. Old carbon content in groundwater seems to vary from region to region, although the amount of regional variation is not at all well understood at this time. The amount of fish in the diet can be estimated on the basis of  $^{15}\text{N}$  levels in bone. Fish have much higher percentages of  $^{15}\text{N}$  in their tissues than does any other animal, so humans with high  $^{15}\text{N}$  in their bones probably ate a lot of fish. High  $^{15}\text{N}$  in human bones is a signal that radiocarbon dates from those bones probably will yield ages that are too old.

Research to correct for reservoir effects in the steppes is just beginning as I write this, so I cannot solve the problem. But many of the radiocarbon dates from steppe archaeology are from cemeteries, and the dated material often is human bone. Widespread tests of the  $^{15}\text{N}$  in human bone from many different steppe cemeteries, from Kazakhstan to Ukraine, indicate that fish was a very important part of most ancient steppe diets, often accounting for 50% of the meat consumed. Because I did not want to introduce dates that were probably wrong, I used an approach discussed by Bonsall, Cook, and others, and described by them as *preliminary* and *speculative*. They studied five graves in the lower Danube valley where

human bone and animal bone in the same grave yielded different ages (see chapter 7 for references). Data from these graves suggested a correction method. The average level of  $^{15}\text{N}$  in the human skeletons (15.1%) was equated with an average radiocarbon error ( $425 \pm 55$ ) that should be *subtracted* prior to calibrating those dates. These averages could be placed on a scale between the known minimum and maximum levels of  $^{15}\text{N}$  found in human bone, and, speculatively, a given level of  $^{15}\text{N}$  could be equated with an average error in radiocarbon years. The scale shown in figure A.1 was constructed in this way. It seems to yield results that solve some long-problematic dating offsets in steppe chronology (see ch. 9, notes 4, 16, and 22; and ch. 12, note 30). When I use it—when dates are based principally on human bone—I warn readers in the text. Whatever errors it introduces probably are smaller than those caused by ignoring the problem. All the radiocarbon dates listed in the tables in this book are regular BP and calibrated BCE dates, without any correction for the reservoir effect.

Figure A.1 shows the correction scale I used to revise dates that were measured from human bone in regions where I knew the average  $^{15}\text{N}$  levels in human bone. The top number is the number of years that should be

TABLE A.1

The average  $^{13}\text{C}$  and  $^{15}\text{N}\%$  in human bone from seventy-two individuals excavated from graves in the Samara oblast, by time period.

Time Period	Sample Size	C13	N15	Years to Subtract
MESOLITHIC	5	-20.6	13.5	$-330 \pm 42$
NEOLITHIC	8	-22.3	11.8	$-228 \pm 30$
EARLY ENEOL	6	-20.9	14.8	$-408 \pm 52$
LATE ENEOL	6	-21.0	13.1	$-306 \pm 39$
EBA	11	-18.7	11.7	$-222 \pm 30$
MBA	11	-19.0	12.0	$-240 \pm 32$
POTAPOVKA	9	-19.1	11.3	$-198 \pm 26$
EARLY LBA	7	-19.1	11.4	$-204 \pm 27$
LATE LBA	9	-18.9	11.2	$-192 \pm 26$

subtracted from the BP radiocarbon date; the bottom number is the  $^{15}\text{N}$  level associated with specific subtraction numbers.

Table A.1, based on our own studies in the Samara oblast, shows the average  $^{15}\text{N}$  content in human bone for different periods, taken from measurements on seventy-two individuals.

## NOTES



### CHAPTER 1. THE PROMISE AND POLITICS OF THE MOTHER TONGUE

1. Bloch 1998:109.
2. See Sapir 1912:228.
3. Cannon 1995:28–29.
4. Poliakov 1974:188–214.
5. Veit 1989:38.
6. Grant 1916.
7. For “external origin” passages in the *Rig Veda*, see Witzel 1995. For “indigenous origin” arguments, see N. Kazanas’s discussions in the *Journal of Indo-European Studies* 30, nos. 3–4 (2002); and 31, nos. 1–2 (2003).
8. For the Nazi pursuit of Aryan archaeology, see Arnold 1990.
9. For goddesses and Indo-Europeans, see Anthony 1995b; Eisler 1987, 1990; and Gimbutas 1989, 1991. For Aryan-identity politics in Russia, see Shnirelman 1998, 1999.
10. Heidegger 1959:37–51, contrasted to Boaz 1911. For the non-Aryan element in the *Rig Veda*, see Kuiper 1948, 1991.
11. Harding and Sokal 1988.
12. The *American Heritage Dictionary* has thirteen hundred unique Proto-Indo-European roots listed in its appendix. But multiple reconstructed words are derived from the same root morphemes. The number of reconstructed words with distinct meanings is much greater than the number of unique roots.
13. For doubts about proto-languages and tree diagrams, see Lincoln 1991; and Hall 1997. For a more nuanced view of tree diagrams, see Stewart 1976. For “creolization” and convergence creating Proto-Indo-European, see Renfrew 1987:78–86; Robb 1991; and Sherratt and Sherratt 1988.
14. For framing, see Lakoff 1987:328–37.

### CHAPTER 2. HOW TO RECONSTRUCT A DEAD LANGUAGE

1. Here is the text of the tale:  
A sheep, shorn of its wool, saw some horses, one moving a heavy cart, another carrying a big load, a third carrying a human speedily. The sheep said to the horses: “It pains me [literally, “the heart narrows itself for me”] to see human driving horses.” The horses said: “Listen sheep, it pains us to see that human, the master, makes the wool of the sheep into a warm garment for himself and the sheep no longer has any wool!” On hearing that the sheep ran off into the fields.

It is impossible to construct whole sentences like this with confidence in a language known only in fragments. Proto-Indo-European tense markers in the verbs are debated, the form of the relative pronoun is uncertain, and the exact construction of a Proto-Indo-European complement (sheep saw horse carrying load) is unknown. Linguists still see it as a classic challenge. See Bynon 1977:73–74; and Mallory 1989:16–17.

2. This chapter is generally based on four basic textbooks (Bynon 1977; Beekes 1995; Hock and Joseph 1996; and Fortson 2004), and on various encyclopedia entries in Mallory and Adams 1997.

3. Embleton 1991.
4. Pinker 1994.
5. An example of a change in phonology, or pronunciation, that caused shifts in morphology, or grammar, can be seen in English. German has a complex system of noun and pronoun case endings to identify subjects, objects, and other agents, and verb endings that English lacks. English has lost these features because a particular dialect of Middle English, Old Northumbrian, lost them, and people who spoke the Old Northumbrian dialect, probably rich wool merchants, had a powerful effect on the speech of Medieval London, which happened to give us Modern English. The speakers of Old Northumbrian dropped the Germanic word-final *n* and *m* in most suffixes (*esse*', not *essen*, for "to eat"). In late Old English the pronunciation of many short vowels (like the final *-e* that resulted here) was already merging into one vowel (the [uh] in *sofa*, called *schwa* by linguists). These two shifts in pronunciation meant that many nouns no longer had distinctive endings, and neither the infinitive nor the subjunctive plural verb had a distinct ending. Later, between 1250 and 1300, the word-final *schwa* began to be dropped from most English speech, which wiped out the distinction between two more grammatical categories. Word order became fixed, as few other guides indicated the difference between subject and object, and auxiliary particles like *to*, *of*, or *by* were employed to distinguish infinitives and other forms. Three shifts in pronunciation were responsible for much of the grammatical simplification of modern English. See Thomason and Kaufman 1988:265–275.
6. For Grimm's Law, see Fortson 2004:300–304.
7. Some linguists argue that the Proto-Indo-European root did not begin with *k* but rather with a palato-velar, a *kb*-type sound, which would require that the first consonant was moved back in the *centum* languages rather than forward in the *satem* languages. See Melchert 1994:251–252. Thanks to Bill Darden for pointing this out.
8. Hock and Joseph 1996:38.
9. For pessimistic views on the "reality" of reconstructed Proto-Indo-European, see Bynon 1977; and Zimmer 1990. For optimistic views, see Hock and Joseph 1996:532–534; and Fortson 2004:12–14.
10. Hall 1950, 1976.
11. Bynon 1977:72. Mycenaean was in a transitional state in 1350 BC, when it was recorded. Some Proto-Indo-European words with *kʷ* had already shifted to *k* in Mycenaean. The alternation between *\*kʷ* and *\*p* probably was already present in some dialects of Proto-Indo-European.
12. For doubts on reconstructed meanings, see Renfrew 1987:80, 82, 260. For the argument that comparing cognates requires that the meanings of the compared terms are subjected to fairly strict limits, see Nichols 1997b.

### CHAPTER 3. LANGUAGE AND TIME 1

1. See Swadesh 1952, 1955; and Lees 1953.
2. The replacement rate cited here compares the core vocabulary in Modern English to the core vocabulary in Old English, or Anglo-Saxon. Much of the Old English core vocabulary was replaced by Norse, but, since Norse was another Germanic language, most of the core vocabulary remains Germanic. That is why we can say that 96% of the core vocabulary remains Germanic, and at the same time say that the replacement rate in the core vocabulary was a high 26%.
3. Much of the information in this section came from Embleton 1991, 1986. See also McMahon and McMahon 2003; and Dyen, Kruskal, and Black 1992. Many linguists are hostile to any claim that a cross-cultural core vocabulary can be identified. The Australian aboriginal languages, for example, do not seem to have a core vocabulary—all vocabulary items are equally vulnerable to replacement. We do not understand why. Both sides of the debate are represented in Renfrew, McMahon, and Trask 2000.

4. Meid 1975; Winfred 1989; and Gamkrelidze and Ivanov 1984:267–319.
5. Ivanov derived Hittite (Northern Anatolian) and Luwian (Southern Anatolian) separately and directly from Proto-Indo-European, without an intervening proto-language, making them as different as Celtic and Greek. Most other linguists derive all the Anatolian languages from a common source, Proto-Anatolian; see Melchert 2001 and Diakonoff 1985. Lydian, spoken on the western coast of Anatolia in the Classical era, might have descended from the same dialect group as Hittite. Lycian, spoken on the southwestern coast, probably descended from the same dialects as Luwian. Both became extinct in the Classical era. For all these topics, see Drews 2001.
6. For the Anatolian languages, see Fortson 2004:154–179; Houwink Ten Cate 1995; Veenhof 1995; and Puhvel 1991, 1994. For the glottalic perspective, see Gamkrelidze and Ivanov 1995.
7. Wilusa was a city west of the Hittite realm. It is very possible that Wilusa was Troy and that the Trojans spoke Luwian. See Watkins 1995:145–150; and Latacz 2004.
8. The non-Indo-European substrate effect on Luwian was described by Jaan Puhvel (1994:261–262) as “agglutinative creolization . . . What has happened to Anatolian here is reminiscent of what became of French in places like Haiti.” Hittite showed similar non-Indo-European substrate effects and had few speakers, causing Zimmer (1990:325) to note that, “on the whole, the Indo-Europeanization of Anatolia failed.”
9. Melchert 2001.
10. Forster 2004; Baldi 1983:156–159.
11. Lehrman 2001. The ten innovations that Lehrman identified as distinctive of Proto-Indo-European included two phonological traits (e.g., loss of the laryngeals), three morphological traits in nouns (e.g., addition of the feminine gender), and five morphological traits in verbs.
12. See Sturtevant 1962 for the Indo-Hittite hypothesis. For Anatolian as a daughter of very early Proto-Indo-European, see Puhvel 1991. Lehrman (2001) pointed out that Anatolian had a different word from Proto-Indo-European for *man*, usually considered part of the core vocabulary. The Anatolian term (*\*pāsna-*) used a root that also meant “penis,” and the Proto-Indo-European term (*\*wiro-*) used a root that also meant “strength.” Proto-Anatolian and Proto-Indo-European did, however, share cognate terms for *grandfather* and *daughter*, so their kinship vocabularies overlapped. Classic Proto-Indo-European and Anatolian probably emerged from different places and different times in the Pre-Proto-Indo-European dialect chain.
13. For Pre-Greek language(s) of Greece, see Hainsworth 1972; and Francis 1992.
14. For the oldest language in the Indic branch I use the term *Old Indic* instead of *Indo-Aryan*. The standard nomenclature today is *Indo-Iranian* for the parent, *Avestan Iranian* for the oldest Iranian daughter, and *Indo-Aryan* for the oldest Indic daughter. But the designation *Aryan* for Indic is unnecessary; they were all Aryan. For the language and history of the *Rig-Veda*, see Erdosy 1995.
15. For Old Indic terms among the Mitanni, see Thieme 1960; Burrow 1973; and Wilhelm 1995. I thank Michael Witzel for his comments on Mitanni names. Any errors are my own.
16. For a date for Zarathustra before 1000 BCE, see Boyce 1975; and Skjærvø 1995. For the “traditional” date promulgated by ancient Greek sources, five hundred years later, see Malandra 1983.
17. Clackson (1994) and Hamp (1998) argued that Pre-Armenian was linked to the Greek-Indo-Iranian block. See also the isogloss map in Antilla 1972, figure 15.2. Many of the shared lexical items are discussed and described in Mallory and Adams 1997. I am grateful to Richard Diebold for his analysis of Greek/Indo-Iranian relations in a long letter of October 1994, where he pointed out that the shared innovations link Greek and Iranian closely, and Greek and Indic somewhat less.
18. See Rijksbaron 1988 and Drinka 1995 for the shared poetic functions of the imperfect. Poetics, shared phrases, and weapon terms are reviewed in Watkins 1995, chap. 2, 435–436.

19. See Ringe et al. 1998; and also Ringe, Warnow, and Taylor 2002. Similar cladistic methods were applied to a purely lexical data set in Rexová, Frynta, and Zrzavý 2003.

## CHAPTER 4. LANGUAGE AND TIME 2

1. See Darden 2001, esp. 201–204, for the etymology of the term *wool*. For the actual textiles, see Barber 2001, 1991; and Good 1998.

2. The “unspinnable” quotation is from Barber 2001:2. The mitochondrial DNA in modern domesticated sheep indicates that all are descended from two ancient episodes of domestication. One cluster (B), including all European and Near Eastern sheep, is descended from the wild *Ovis orientalis* of eastern Anatolia or western Iran. The other cluster (A) is descended from another *Ovis orientalis* population, probably in north-central Iran. Other wild Old World ovi-caprids, *Ovis ammon* and *Ovis vignei*, did not contribute to the genes of domesticated sheep. See Hiendleder et al. 2002. For a general discussion of sheep domestication, see Davis 1987; and Harris 1996.

3. In the Ianna temple of Uruk IV (3400–3100 BCE) artists depicted women making textiles. The later Sumerian names for some months incorporated the term for plucking sheep. The zoological evidence suggests that the months were named this way during the Late Uruk period or afterward, not before.

4. Zoological evidence for wool production in the Near East is reviewed by Pollack (1999:140–147). For Arslantepe, see Bökönyi 1983. An earlier date for wool sheep could be indicated by a couple of isolated pieces of evidence. The phase A occupation at Hacinebi on the Euphrates, dated 4100–3800 BCE, had spindle-whorls that seemed the right weight for spinning wool, which requires a light spindle; see Keith 1998. A clay sheep figurine from Tepe Sarab in western Iran (Kermanshah) seems to show a woolly fleece, from a level dated about 5000 BCE. For a broader discussion, see Good 2001.

5. For the caprids (sheep and/or goats) at Khvalynsk, see Petrenko 1984. Petrenko did not report the age at death for all the caprids in the Khvalynsk graves, but six of the twelve with reported ages were adults. Sacrificial deposit #11 contained 139 bones of caprids representing four adults and five sub-adults, and the *average* adult withers height was 78 cm, almost 15 cm taller than other European Neolithic caprids. For Svobodnoe sheep, see Nekhaev 1992:81. For sheep in Hungary, see Bökönyi 1979:101–116. For sheep in Poland, see Milisauskas 2002:202.

6. For wool at Novosvobodnaya, see Shishlina, Orfinskaya, and Golikov 2003. For evidence of Catacomb-period wool (dated ca. 2800–2200 BCE) in the North Caucasian steppes, see Shishlina 1999. Sherratt’s updated comments on wool are included in the revised text of an older article in Sherratt 1997a.

7. The term for hub or nave, which is often included in other lists, also meant “navel” in Proto-Indo-European, so its exact meaning is unclear. For the wheel-wagon vocabulary, see Specht 1944. Three influential updates were Gamkrelidze and Ivanov 1984:718–738; Meid 1994; and Häusler 1994. I first published on the topic in Anthony and Wailes 1988; and also in Anthony 1991a, 1995a. As with most of the topics covered in this book, there is an excellent review of the Indo-European wheel vocabulary in Mallory and Adams 1997.

8. Don Ringe communicated the argument against *burki-* to me in a letter in 1997. Bill Darden discussed the Anatolian terms in Darden 2001.

9. I am indebted to Mary Littauer for alerting me to draft experiments carried out in 1838–40 with wagons and carts on different road surfaces, where it was determined that the draft of a wagon was 1.6 times greater than that of a cart of the same weight. See Ryder 1987.

10. For the earliest wheeled vehicles, see Bakker et al. 1999; and Piggott 1983. For European wheels, see Häusler 1992; and Hayen 1989. For Mesopotamia, see Littauer and Crouwel 1979; and Oates 2001. The most comprehensive analysis of the steppe vehicle burials, still unpublished, is by Izbitser 1993, a thesis for the Institute of the History of Material Culture in

St. Petersburg. Izbitser is working on an English-language update from her post in the New York Metropolitan Museum. Other key steppe accounts are in Mel'nik and Serdiukova 1988, and the section on wagons in Gei 2000:175–192.

11. Sherratt's essays were compiled and amended in Sherratt 1997. He continued to suggest that horseback riding in the steppes was inspired by Near Eastern donkey riding; see 1997:217. An early critical response to the SPR is Chapman 1983.

12. For Neolithic sleds in Russia, see Burov 1997. Most of them were joined with mortise-and-tenon joints, and equipped with bent-wood curved runners. These are the same carpentry skills needed to make wheels and wooden-slat tires.

13. The version of the Renfrew hypothesis I use here was published as Renfrew 2001. For assenting views among archaeologists, see Zvelebil and Zvelebil 1988; Zvelebil 1995; and Robb 1991, 1993. Robert Drews (2001) began in a different place but ended up supporting Renfrew.

14. For the north Syrian origin of the Anatolian Neolithic population, see Bar-Yosef 2002; for the likely Afro-Asiatic linguistic affiliation of these first farmers, see Militarev 2002.

15. See Gray and Atkinson 2003, reviewed by Balter 2003. The linguist L. Trask criticized Gray and Atkinson's methods, and Gray responded on his homepage, updated March 2004, at <http://www.psych.auckland.ac.nz/psych/research/Evolution/GrayRes.htm>.

16. Buck 1949:664, with Indo-European terms for *turn*, *turn around*, *wind*, and *roll*. Gray's argument for a natural independent development of the term *wheel* from *to turn* (wheel=the turner) is further complicated by the fact that there are two reconstructed Proto-Indo-European terms for *wheel*, and the other one was based on the Proto-Indo-European verb \**reth-* 'run' (wheel=the runner), a different semantic development.

17. Renfrew 2001:40–45; 2000. Renfrew's hypothesis of a very long-lived Proto-Indo-European phase, surviving for many millennia, is supported by some linguists. For a view that Proto-Indo-European was spoken from the Mesolithic through the end of the Corded Ware period, or about 6000–2200 BCE, see Kitson 1997, esp. 198–202.

18. Childe 1957:394.

19. Mallory 1989:145–146; and Anthony 1991a. For Africa, see Nettles 1996.

## CHAPTER 5. LANGUAGE AND PLACE

1. For homeland theories, see Mallory 1989, chap. 6. For political uses of the past in the Soviet Union, see Shnirelman 1995, 1999; Chernykh 1995; and Kohl and Tsetskhladze 1995. For the belief in an Aryan-European “race,” see Kühl 1994; and Poliakov 1974.

2. The Pontic-Caspian steppe homeland hypothesis was defended in English most clearly by Gimbutas 1970, 1977, 1991; and Mallory 1989, updated in Mallory and Mair 2000. Although I agree with Gimbutas's homeland solution, I disagree with her chronology, her suggested causes for the expansion, and her concept of Kurgan-culture migrations, as I explained in detail in Anthony 1986.

3. See Dixon 1997:43–45. Similarly for Zimmer 1990:312–313, “reconstructions are pure abstractions incapable of being located or dated . . . no philological interpretation of the reconstructed items is possible.”

4. The tree model does not exclude or deny some areal convergence. All languages contain elements based on both branching structures and convergence with neighbors. On areal borrowing, see Nichols 1992.

5. See Thomason and Kaufman 1992; Nichols 1992; and Dixon 1997. All support the derivation of the Indo-European languages from Proto-Indo-European. Dixon (1997:31), although a critic of the criteria used to create some family tree models, stated: “The genetic relatedness of the Indo-European languages, in a family tree model, has of course been eminently proved.” A good brief review of various approaches to convergence can be found in Hock and Joseph 1996:388–445.

6. Gradual convergence between neighboring languages can result in several different kinds of similarities, depending on the social circumstances. The range of possibilities includes *trade jargons*, crude combinations of words from neighboring languages barely sufficient to communicate for purposes of trade or barter; *pidgins*, which evolve from trade jargons or from a multitude of partially known languages in a colonial encounter where a colonial target language supplies much of the content of the pidgin; and *creoles*, which can evolve from pidgins or can arise abruptly in multiethnic forced labor communities where again a colonial target language supplies much of the content. Unlike pidgins, creoles contain the essential grammatical structures of a natural language, but in a reduced and simple form. They can, of course, be as expressive in song, poetry, and metaphor as any natural language, so the fact that they are grammatically simple is not a value statement. All these ways of speaking pass through a bottleneck of great grammatical simplification. Indo-European grammar is not at all like a creole grammar. See Bickerton 1988; and Thomason and Kaufman 1988.

7. Pulgram, in 1959, suggested that the comparative method, applied to the modern Romance words for *coffee*, would produce a false Latin root for *coffee* in Classical Latin. But Pulgram's claim was rebutted by Hall (1960, 1976). Pulgram's argument was cited in Renfrew (1987:84–86) but corrected in Diakonov (1988: n. 2).

8. For Pre-Indo-European substrate terms in Balto-Slavic, see Andersen 2003. For Greek and pre-Greek place-names, see Hester 1957; Hainsworth 1972; and Renfrew 1998. In northern Europe, at least three different extinct non-Indo-European languages have been identified: (1) the “language of Old European hydronymy,” preserved principally in non-Indo-European river names; (2) the “language of bird names,” preserved in the names of several kinds of birds, including the blackbird, lark, and heron, and also in other terms borrowed into early Germanic, Celtic, and Latin, including the terms for *ore* and *lightning*; and (3) the “language of geminates,” which survives only in a few odd sounds quite atypical for Indo-European, borrowed principally into Germanic but also into a few Celtic words, including doubled final consonants and the word-initial [kn-], as in *knob*. See Schrijver 2001; Venneman 1994; Huld 1990; Polomé 1990; and Krahe 1954.

# 9. For *beech* and *salmon* as terms that limited Proto-Indo-European to northern Europe, see Thieme 1958. Friedrich 1970 showed that the *beech* root referred variously to beech, oak, and elder trees in several branches, and that in any case the common beech grew in the Caucasus Mountains, making it useless as a diagnostic northern European tree word. Diebold 1985 summarized the evidence against salmon as a limiting geographic term. For the honeybee argument, see the excellent study by Carpelan and Parpola 2001. See also the articles on salmon and beech in Mallory and Adams 1997.

10. This interpretation of Proto-Indo-European \**peku* is that of Benveniste 1973:40–51.

11. This reconstruction of Proto-Indo-European society is based on Benveniste 1973, numerous entries in Mallory and Adams 1997, and Gamkrelidze and Ivanov 1995.

12. For Proto-Uralic linkages with Proto-Indo-European, see Carpelan, Parpola, and Koskikallio 2001, particularly the articles by Koivulehto and Kallio. See also Janhunen 2000; Sinor 1988; and Ringe 1997.

13. For a Yeniseian homeland, see Napol'skikh 1997.

14. Koivulehto 2001.

15. Janhunen (2000) has somewhat different forms for some of the pronouns. Nichols pointed out in a note to me that the *-m* and *-n* shared inflections are not very telling; only a whole paradigm of shared inflections is diagnostic. Also, nasal consonants occur in high frequencies and apparently are prone to occur in grammatical endings, and so it is the pronouns that are really important here.

16. Nichols 1997a.

17. For the glottalic theory, see Gamkrelidze and Ivanov 1973; see also Hopper 1973. For their current views, see Gamkrelidze and Ivanov 1995.

18. For discussions of the glottalic theory, see Diakonov 1985; Salmons 1993; and Szemerédy 1989.

19. For critical discussions of the Semitic-Proto-Indo-European and Kartvelian-Semitic-Proto-Indo-European loan words, see Diakonov 1985:122–140; and Nichols 1997a appendix. On the chronology of the Proto-Kartvelian dispersal or breakup, see Harris 1991.

## CHAPTER 6. THE ARCHAEOLOGY OF LANGUAGE

1. My definitions are adapted from Prescott 1987. A different set of definitions was suggested by Parker 2006. He suggested *boundary* as the general term (what I am calling borders) and *border* as a specific term for a political or military boundary (more or less what I am calling a boundary). Parker tried to base his definitions partly on vernacular understandings of how these words are normally used, a noble goal; but I disagree that there is any consistency of usage in the vernacular, and prefer to use established definitions. In their review of the borderland literature, Donnan and Wilson (1999:45–46) followed Prescott in using *border* as the general or unspecialized term. The classic work to which I owe a great deal of my thinking is Barth 1969. For archaeological treatments of ethnic borders, see Shennan 1989, and Stark 1998.

2. For the growth of Medieval European regional identities, see Russell 1972; and Bartlett 1993. For the anthropological deconstruction of tribes and bounded cultures, see Fried 1975; and Wolf 1982, 1984. See also Hill 1992; and Moore 2001. For good archaeological uses of this border-deconstructing approach to ethnicity see Wells 2001; Florin 2001; MacEachern 2000; and James 1999.

3. See Hobsbawm 1990; Giddens 1985; and Gellner 1973. Giddens (1985:120) famously referred to the nation-state as a “bordered power-container.” For a different interpretation of ancient tribes and borders, see Smith 1998. He is accused of being a “primordialist”; see his defense in chapter 7. Also see Armstrong 1982.

4. For projectile points and language families in South Africa, see Weissner 1983. For a good review of material culture and ethnicity, see Jones 1997, esp. chap. 6.

5. For New Guineau, see Terrell 2001; see also Terrell, Hunt, and Godsen 1997. For the original argument that biology, culture, and language were separate and independent, see the introduction to Boaz 1911. For California, see Jordan and Shennan 2003. For the other examples, see Silver and Miller 1997:79–98.

6. Persistent frontiers were the subject of a flurry of studies in the 1970s; see Spicer 1971 and a volume dedicated to Spicer by Castile and Kushner 1981. The focus in these papers was the maintenance of stigmatized minority identities. In archaeology, the long-term persistence of prehistoric “culture areas” was discussed long ago in Ehrich 1961. The subject was revisited by Kuna 1991; and Neustupny 1991. My first paper on the subject was Anthony 2001.

7. For the persistence of the Hudson-Valley Iroquoian/Algonkian frontier, see Chilton 1998. For the Linear Pottery frontier, see Zvelebil 2002. For the Jastorf/Halstatt frontier, see Wells 1999.

8. Emberling (1997) used the term *redundant* rather than *robust* for material-culture borders that were marked in multiple categories of material culture, and he recognized that this redundancy suggested that these borders were particularly important socially.

9. For Wales, see Mytum 1994; and John 1972. For the genetic border at the Welsh/English frontier, see Weale et al. 2002. For the border near Basle, see Gallusser 1991. On Breton culture, see Jackson 1994; and Segalen 1991. For the German/Romansh frontier in Italy, see Cole and Wolf 1974.

10. For the Ucayali quotation, see DeBoer 1990:102. For language and genetic correlations, see Jones 2003.

11. For the Iroquois, see Wolf 1982:167; 1984:394; and, in contrast, see Tuck 1978; Snow 1994; and Richter 1992. Moore (2001:43) also used intermarriages between Amerindian tribes as an index of general cultural and linguistic mixing: "These [marriage] data show a continual movement of people, and hence their genes, language, and culture, from society to society" (emphasis mine).
12. For the borders of functional zones, see Labov 1994. For functional zones, see Chambers and Trudgill 1998; and Britain 2002.
13. See Cole and Wolf 1974:81–282; see also Barth 1969. Cole and Wolf wrote a perceptive analysis of a persistent frontier in Italy, and then in 1982 Wolf published his best-known book, which suggested that tribal borders outside Europe were much more porous and changeable. In making this argument he seems, in my view, to have made some statements contradicted by his own earlier field work.
14. For the billiard-ball analogy, see Wolf 1982:6, 14. On migration processes generally, see Anthony 1990, 1997. Archaeologists of the American Southwest have pushed migration theory further than those of any other region. For a sampling see Spielmann 1998. For migration theory in Iroquoian archaeology, see Sutton 1996.
15. For the four Colonial cultural provinces, see Fischer 1989; Glassie 1965; and Zelinsky 1973. Although anthropology veered away from cultural geography in the 1980s and 1990s, historians and folklorists continued to study it. See Upton and Vlach 1986; and Noble 1992. For a review of the historians' interest in cultural geography in North America, see Nash 1984.
16. Clark 1994.
17. Kopytoff 1987.
18. For the Nuer, see Kelley 1985. For the effect of changes in bride-price currencies on basic subsistence economies, see Cronk 1989.
19. On dialect leveling among colonists, see Siegel 1985; Trudgill 1986; and Britain 2004. The degree of leveling depends on a number of social, economic, and linguistic factors; see Mufwene 2001. For Spanish leveling in the Americas, see Penny 2000. On the history of American English dialects, see Fischer 1989.
20. For charter groups, see Porter 1965; and Breen 1984. On German immigrants in Ohio, see Wilhelm 1992. On Puritan charter groups in new England, see Fischer 1989:57–68. On the Maya, see Fox 1987, although now there are criticisms of Fox's migration-based history; on apex families, see Alvarez 1987; and on the Pueblo, see Schlegel 1992.
21. On leveling and simplification in material culture among colonists, see Noble 1992; and Upton and Vlach 1986. Burmeister (2000) noted that the external form of residential architecture tends to conform to broad norms, whereas ethnicity is expressed in internal details of decoration and ornament.
22. The Boasian approach to borders is reviewed in Bashkow 2004.
23. On the provinces of France, see Chambers and Trudgill 1998:109–123; on the Maasai, see Spear and Waller 1993; on Burma, see Leach 1968, 1960; and for a different interpretation of Burma, see Lehman 1989.
24. On language and ecology, see Hill 1996; and Nettles 1996. Hill's paper was published later in Terrell 2001:257–282. Also see Milroy 1992.
25. The concept of ecologically determined "spread zones" for languages came from Nichols 1992. Similar ideas about arid zones and language expansion can be found in Silver and Miller 1997:79–83. Renfrew (2002) applied the term *spread zone* to any region of rapid language spread, particularly any expansion of pioneer farmers, regardless of ecology. Campbell (2002), however, warned against mixing these definitions.
26. For China, see DiCosmo 2002; and Lattimore 1940.
27. For Acholi origins, see Atkinson 1989, 1994.
28. A similar model for the growth of Bronze Age chiefdoms, described long before Atkinson's case study was published, was by Gilman 1981.
29. For the Pathan-Baluch shift, see Mallory 1992; Barth 1972; and Noelle 1997.

## CHAPTER 7. HOW TO RECONSTRUCT A DEAD CULTURE

1. For the history of Christian J. Thomsen's Three-Age System, see Bibby 1956.
2. I generally follow the Eneolithic and Bronze Age chronology of Victor Trifonov at the Institute of the History of Material Culture in St. Petersburg; see Trifonov 2001.
3. For the impact of radiocarbon dating on our understanding of European prehistory, see Renfrew 1973.
4. The old carbon problem in freshwater fish is explained in Cook et al. 2002; and in Bon-sall et al. 2004. I used their method to create the correction scale that appears in the appendix.
5. A good historical review of radiocarbon dating in Russian archaeology is in Zaitseva, Timofeev, and Sementsov 1999.
6. For a good example of cultural identity shifting in response to changing historical situations, see Haley and Wilcoxon 2005. For Eric Wolf's and Anthony Smith's comments on situational politics alone being insufficient to explain emotional ties to a cultural identity see Cole and Wolf 1974:281–282; and Smith 1998, chap. 7.
7. For technological style and cultural borders, see Stark 1998.

## CHAPTER 8. FIRST FARMERS AND HERDERS

1. The three sky gods named here almost certainly can be ascribed to Proto-Indo-European. *Dyeus Pater*, or Sky/Heaven Father, is the most certain. The Thunder/War god was named differently in different dialects but in each branch was associated with the thunderbolt, the hammer or club, and war. The Divine Twins likewise were named differently in the different branches—the Nāsatyas in Indic, Kastōr and Polydeukēs in Greek, and the Dieva Dēli in Baltic. They were associated with good luck, and often were represented as twin horses, the offspring of a divine mare. For Trita, see Watkins 1995; and Lincoln 1981:103–124. More recently, see Lincoln 1991, chap. 1. For the twins, see Puhvel 1975; and Mallory and Adams 1997:161–165.
2. For the tripartition of Indo-European society, see Dumézil 1958; and Littleton 1982. There is a good review in Mallory 1989:128–142. For an impressive example of the interweaving of three's and two's in Indo-European poetry, see Calvert Watkin's analysis of a traditional Latin poem preserved by Cato in 160 BCE, the “*Lustration of the Fields*.” The structure is tripartite, expressed in a series of doubles. See Watkins 1995:202–204.
3. Przewalski horses are named after the Polish colonel who first formally described them in 1881. A Russian noble, Frederic von Falz-fein, and a German animal collector, Carl Hagenbeck, captured dozens of them in Mongolia, in 1899 and 1901. All modern Przewalski's are descended from about 15 of these animals. Their wild cousins were hunted to extinction after World War II; the last ones were sighted in Mongolia in 1969. Zoo-bred populations were reintroduced to two preserves in Mongolia in 1992, where once again they are thriving.
4. For differences between east-Ural and west-Ural Upper Paleolithic cultures, see Borisovskii 1993, and Lisitsyn 1996.
5. For a wide-ranging study of the Ice Age Caspian, the Khvalynian Sea, and the Black Sea, including the “Noah's Flood” hypothesis, see Yanko-Hombach et al. 2006.
6. For the decline of matriliney among cattle herders, see Holden and Mace 2003.
7. For Y-chromosome data on early European cattle, see Gotherstrom et al. 2005. For MtDNA, see Troy et al. 2001; and Bradley et al. 1996.
8. For agricultural frontier demography, see Lefferts 1977; and Simkins and Wernstedt 1971.
9. For the oldest Criș site in the lower Danube valley, see Nica 1977. For a Starcevo settlement in the plains north of Belgrade, see Greenfield 1994.

10. For Criş immigrants in the East Carpathians, see Dergachev, Sherratt, and Larina 1991; Kuzminova, Dergachev, and Larina 1998; Telegin 1996; and Ursulescu 1984. The count of thirty sites refers to excavated sites. Criş pottery is known in unexcavated surface exposures at many more sites listed in Ursulescu 1984. For the Criş economy in eastern Hungary, see Vörös 1980.
11. For Neolithic bread, see Wahren 1989. Criş people cultivated gardens containing four varieties of domesticated wheat: *Triticum monococcum*, *T. dicoccum* Shrank, *T. spelta*, *T. aestivoccompactum* Schieman; as well as barley (*Hordeum*), millet (*Panicum miliaceum*), and peas (*Pisum*)—all foreign to eastern Europe. On the plant evidence, see Yanushovich 1989; and Pashkevich 1992.
12. Markevich 1974:14.
13. For the possible role of acculturated foragers in the origin of the East Carpathian Criş culture, see Dergachev, Sherratt, and Larina 1991; and, more emphatically, Zvelebil and Lillie 2000.
14. On pioneer farmers and language dispersal, see Bellwood and Renfrew 2002; Bellwood 2001; Renfrew 1996; and Nichols 1994. On the symbolic opposition of wild and domesticated animals, see Hodder 1990.
15. Most archaeologists have accepted the argument made by Perles (2001) that the Greek Neolithic began with a migration of farmers from Anatolia. For the initial spread from Greece into the Balkans, see Fiedel and Anthony 2003. Also see Zvelebil and Lillie 2000; and van Andel and Runnels 1995. The practical logistics of a Neolithic open-boat crossing of the Aegean are discussed in Broodbank and Strasser 1991.
16. For \**tawro-*s, see Nichols 1997a: appendixes. For the association of Afro-Asiatic with the initial Neolithic, see Militarev 2003.
17. The classic Russian-language works on the Bug-Dniester culture are in Markevich 1974; and Danilenko 1971; the classic discussion in English is in Tringham 1971. More recently, see Telegin 1977, 1982, and 1996; and Wechler, Dergachev, and Larina 1998.
18. For the Mesolithic groups around the Black Sea, see Telegin 1982; and Kol'tsov 1989. On the Dobrujan Mesolithic, see Paunescu 1987. For zoological analyses, see Benecke 1997.
19. Most of the dates for the earliest Elshanka sites are on shell, which might need correction for old carbon. Corrected, Elshanka dates might come down as low as 6500–6200 BCE. See Mamonov 1995, and other articles in the same edited volume. For radiocarbon dates, see Timofeev and Zaitseva 1997. For the technology and manufacture of this silt/mud/clay pottery, see Bobrinskii and Vasilieva 1998.
20. For the dates from Rakushechni Yar, see Zaitseva, Timofeev, and Sementsov 1999. For the excavations at Rakushechni Yar, see Belanovskaya 1995. Rakushechni Yar was a deeply stratified dune site. Telegin (1981) described sedimentary stratum 14 as the oldest cultural occupation. A series of new radiocarbon dates, which I ignore here, have been taken from organic residues that adhered to pottery vessels said to derive from levels 9 to 20. Levels 15 to 20 would have been beneath the oldest cultural level, so I am unsure about the context of the pottery. These dates were in the calibrated range of 7200–5800 BCE ( $7930 \pm 130$  to  $6825 \pm 100$  BP). If they are correct, then this pottery is fifteen hundred years older than the other pottery like it, and domesticated sheep appeared in the lower Don valley by 7000 BCE. All domesticated sheep are genetically proven to have come from a maternal gene pool in the mountains of eastern Turkey, northern Syria, and Iraq about 8000–7500 BCE, and no domesticated sheep appeared in the Caucasus, northwestern Anatolia, or anywhere else in Europe in any site dated as early as 7000 BCE. The earliest dates on charcoal from Rakushechni Yar (6070+100 BP, 5890+105 BP for level 8) come out about 5200–4800 BCE, in agreement with other dates for the earliest domesticated animals in the steppes. If the dated organic residue was full of boiled fish, it could need a correction of five hundred radiocarbon years, which would bring the earliest dates down to about 6400–6200 BCE—somewhat more reasonable. I think the dates are probably contaminated and the sheep are mixed down from upper levels.

21. For 155 Late Mesolithic and Neolithic radiocarbon dates from Ukraine, see Telegin et al. 2002, 2003.
22. On Bug-Dniester plant foods, see Yanushevich 1989; and Kuzminova, Dergachev, and Larina 1998. A report of millet and barley impressions from the middle-phase site of Soroki I/level 1a is contained in Markevich 1965. Yanushevich did not include this site in her 1989 list of Bug-Dniester sites with domesticated seed imprints; it is the only Bug-Dniester site I have seen with reports of barley and millet impressions.
23. The dates here are not on human bones, so they need no correction. The bone percentages are extracted from Table 7 in Markevich 1974; and Benecke 1997. Benecke dismissed the Soviet-era claims that pigs or cattle or both were domesticated independently in the North Pontic region. Telegin (1996:44) agreed. Mullino in the southern Urals produced domesticated sheep bones supposedly dated to 7000 BCE, cited by Matiushin (1986) as evidence for migrations from Central Asia; but like the claimed sheep in deep levels at Rakushechni Yar, these sheep would have been *earlier* than their proposed parent herds at Djeditun, and the wild species was not native to Russia. The sheep bones probably came from later Eneolithic levels. Matiushin's report was criticized for stratigraphic inconsistencies. See Matiushin 1986; and, for his critics, Vasiliev, Vybornov, and Morgunova 1985; and Shorin 1993.
24. Zvelebil and Rowley-Conwy 1984.
25. For captured women and their hyper-correct stylistic behavior, see DeBoer 1986. The archaeological literature on technological style is vast, but a good introduction is in Stark 1998.
26. The Linear Pottery culture in the East Carpathian piedmont overlapped with the Criș culture around 5500–5400 BCE. This is shown at late Criș sites like Grumăzești and Sakarovka that contained a few Linear Pottery sherds. Sakarovka also had Bug-Dniester sherds, so it shows the brief contemporaneity of all three groups.
27. There is, of course, generosity and sharing among farmers, but farmers also understand that certain potential foods are not food at all but investments. Generosity with food has practical limits in bad times among farmers; these are generally absent among foragers. See Peterson 1993; and Rosenberg 1994.
28. The classic text on the Dnieper-Donets culture is Telegin 1968. For an English-language monograph see Telegin and Potekhina. In this chapter I only discuss the first phase, Dnieper-Donets I.
29. For DDI chipped axes, see Neprina 1970; and Telegin 1968:51–54.
30. Vasilievka V was published as a Dnieper-Donets II cemetery, but its radiocarbon dates suggest that it should have dated to DD I. Vasilievka I and III were published as Late Mesolithic, broadly around 7000–6000 BCE, but have radiocarbon dates of the very Early Mesolithic, closer to 8000 BCE. Vasilievka II and Marievka were published as Neolithic but have no ceramics and Late Mesolithic radiocarbon dates, 6500–6000 BCE, and so are probably Late Mesolithic. Changes in human skeletal morphology that were thought to have occurred between the Late Mesolithic and Neolithic (Jacobs 1993) now appear to have occurred between the Early and Late Mesolithic. These revisions in chronology have not generally been acknowledged. For radiocarbon dates, see Telegin et al. 2002, 2003. See also Jacobs 1993, and my reply in Anthony 1994.
31. For Varfolomievka, see Yudin 1998, 1988.
32. The zoologist Bibikova identified domesticated animals—sheep, cattle, and horses—at Matveev Kurgan in levels dated 6400–6000 BCE. Today neither the German zoologist Benecke nor the Ukrainian archaeologist Telegin give credit to Bibikova's claims for an independent local domestication of animals in Ukraine. Matveev Kurgan (a settlement, not a kurgan) is located in the Mius River valley north of the Sea of Azov, near Mariupol. Two sites were excavated between 1968 and 1973, numbered 1 and 2. Both contained Grebenikov-type microlithic flint tools and were thought to be contemporary. Two radiocarbon dates from MK 1 average about 6400–6000 BCE, but the single date (on bone) from MK 2 was about 4400–4000 BCE.

In the latter period domesticated animals including sheep were common in the region. The artifacts from all depths were analyzed and reported as a single cultural deposit. But at MK 1 the maximum number of flint tools and animal bones was found at a depth of 40–70 cm (Krizhevskaya 1991:8), and the dwelling floor and hearths were at 80–110 cm (Krizhevskaya 1991:16). Most of the animal bones from MK 1 and 2 were from wild animals, principally horses, onagers, and wild pigs, and these probably were associated with the older dates. But the bones identified as domesticated horses, cattle, and sheep probably came from later levels associated with the later date. See Krizhevskaya 1991. Stratigraphic inconsistencies mar the reporting of all three Pontic-Ural sites with claimed very early domesticated animals—Rakushechni Yar, Mullino, and Matveev Kurgan.

## CHAPTER 9. COWS, COPPER, AND CHIEFS

1. Benveniste 1973:61–63 for feasts; also see the entry for GIVE in Mallory and Adams 1997:224–225; and the brief recent review by Fortson 2004:19–21.

2. The dates defining the beginning of the Eneolithic in the steppes are principally from human bone, whereas the dates from Old Europe are not. The date of 5200–5000 BCE for the beginning of the Eneolithic Dnieper-Donets II culture incorporates a reduction of  $-228 \pm 30$  radiocarbon years prior to recalibration. There is a discussion of this below in note 16.

3. “Old Europe” was a term revived by Marija Gimbutas, perhaps originally to distinguish Neolithic European farming cultures from Near Eastern civilizations, but she also used the term to separate southeastern Europe from all other European Neolithic regions. See Gimbutas 1991, 1974. For chronologies, economy, environment, and site descriptions, see Bailey and Panayotov 1995; and Lichardus 1991. For the origin of the term *Alteuropa* see Schuchhardt 1919.

4. Most of these dates are on charcoal or animal bone and so need no correction. The earliest copper on the Volga is at Khvalynsk, which is dated by human bone that tested high in  $^{15}\text{N}$  (mean 14.8%) and also seemed too old, from about 5200–4700 BCE, older than most of the copper in southeastern Europe, which was the apparent source of the Khvalynsk copper. I have subtracted four hundred radiocarbon years from the original radiocarbon dates to account for reservoir effects, making the Khvalynsk cemetery date 4600–4200 BCE, which accords better with the florescence of the Old European copper age and therefore makes more sense.

5. For the pathologies on cattle bones indicating they were used regularly for heavy draft, see Ghetie and Mateesco 1973; and Marinescu-Bilcu et al. 1984.

6. For signs and notation, see Gimbutas 1989; and Winn 1981. The best book on female figurines is Pogozheva 1983.

7. Copper tools were found in Early Eneolithic Slatina in southwestern Bulgaria, and copper ornaments and pieces of copper ore (malachite) were found in Late Neolithic Hamangia IIB on the Black Sea coast in the Dobruja hills south of the Danube delta, both probably dated about 5000 BCE. For Old European metals in Bulgaria, see Pernicka et al. 1997. For the middle Danube, see Glumac and Todd 1991. For general overviews of Eneolithic metallurgy, see Chernykh 1992; and Ryndina 1998.

8. For vegetation changes during the Eneolithic, see Willis 1994; Marinescu-Bilcu, Cârciumaru, and Muraru 1981; and Bailey et al. 2002.

9. Kremenetski et al. 1999; see also Kremenetskii 1997. For those who follow the “beech line” argument in Indo-European origin debates, these pollen studies indicate that Atlantic-period beech forests grew in the Dniester uplands and probably spread as far west as the Dnieper.

10. For the ceramic sequence, see Ellis 1984:48 and n. 3. The Pre-Cucuteni I phase was defined initially on the basis of ceramics from one site, Traian-Dealul Viei; small amounts of

similar ceramics were found later at four other sites, and so the phase probably is valid. For an overview of the Tripolye culture, see Zbenovich 1996.

11. Marinescu-Bilcu et al. 1984.
12. Some Tripolye A settlements in the South Bug valley (Lugach, Gard 3) contained sherds of Bug-Dniester pottery, and others had a few flint microlithic blades like Bug-Dniester forms. These traces suggest that some late Bug-Dniester people were absorbed into Tripolye A villages in the South Bug valley. But late Bug-Dniester pottery was quite different in paste, temper, firing, shape, and decoration from Tripolye pottery, so the shift to using Tripolye wares would have been an obvious and meaningful act. For the absence of Bug-Dniester traits in Tripolye material culture, see Zbenovich 1980:164–167; and for Lugach and Gard 3, see Tovkailo 1990.
13. For Bernashevka, see Zbenovich 1980. For the Tripolye A settlement of Luka-Vrublevetskaya, see Bibikov 1953.
14. For the Karbuna hoard, see Dergachev 1998.
15. The Early Eneolithic cultures I describe in this section are also called Late Neolithic or Neo-Eneolithic. Telegin (1987) called the DDII cemeteries of the Mariupol-Nikol'skoe type Late Neolithic, and Yudin (1988) identified Varfolomievka levels 1 and 2 as Late Neolithic. But in the 1990s Telegin began to use the term "Neo-Eneolithic" for DDII sites, and Yudin (1993) started calling Varfolomievka an Eneolithic site. I have to accept these changes, so sites of Mariupol-Nikol'skoe (DDII) type and all sites contemporary with them, including Khvalynsk and Varfolomievka, are called Early Eneolithic. The Late Neolithic apparently has disappeared. The terminological sequence in this book is Early Neolithic (Surskii), Middle Neolithic (Bug-Dniester-DDI), Early Eneolithic (Tripolye A-DDII-Khvalynsk), and Late Eneolithic (Tripolye B, C1-Sredni Stog-Repin). For key sites in the Dnieper-Azov region, see Telegin and Potekhina 1987; and Telegin 1991. For sites on the middle Volga, see Vasiliev 1981; and Agapov, Vasiliev, and Pestriкова 1990. In the Caspian Depression, see Yudin 1988, 1993.
16. The average level of  $^{15}\text{N}$  in DDII human bones is 11.8 percent, which suggests an average offset of about  $-228 \pm 30$  BP, according to the method described in the appendix. I subtracted 228 radiocarbon years from the BP dates for the DDII culture and calibrated them again. The unmodified dates from the earliest DDII cemeteries (Dereivka, Yasinovatka) suggested a calibrated earliest range of 5500–5300 BCE (see Table 9.1), but these dates always seemed too early. They would equate DDII with the middle Bug-Dniester and Criș cultures. But DDII came for the most part *after* Bug-Dniester, during the Tripolye A period. The modified radiocarbon dates for Dnieper-Donets II fit better with the stratigraphic data and with the Tripolye A sherds found in Dnieper-Donets II sites. For lists of dates, see Trifonov 2001; Rassamakin 1999; and Telegin et al. 2002, 2003.
17. For lists of fauna, see Benecke 1997:637–638; see also Telegin 1968:205–208. For  $^{15}\text{N}$  in the bones, see Lillie and Richards 2000. Western readers might be confused by statements in English that the DDII economy was based on hunting and fishing (Zvelebil and Lillie 2000:77; Telegin, et al. 2003:465; and Levine 1999:33). The DDII people ate cattle and sheep in percentages between 30% and 78% of the animal bones in their garbage pits. Benecke (1997:637), a German zoologist, examined many of the North Pontic bone collections himself and concluded that domesticated animals "first became evident in faunal assemblages that are synchronized with level II of the Dnieper-Donets culture." People who kept domesticated animals were no longer hunter-gatherers.
18. Flint blades 5–14 cm long with sickle gloss are described by Telegin (1968:144). The northwestern DDII settlements with seed impressions are listed in Pashkevich 1992, and Okhrimenko and Telegin 1982. DDII dental caries are described in Lillie 1996.
19. Telegin 1968:87.
20. The Vasilievka II cemetery was recently dated by radiocarbon to the Late Mesolithic, about 7000 BCE. The cemetery was originally assigned to the DDII culture on the basis of

a few details of grave construction and burial pose. Telegin et al. 2002 extended the label “Mariupol culture” back to include Vasilievka II, but it lacks all the artifact types and many of the grave features that define DDII-Mariupol graves. The DDII cemeteries are securely dated to a period after 5400–5200 BCE. Vasilievka II is Late Mesolithic.

21. For funeral feasts, see Telegin and Potekhina 1987:35–37, 113, 130.
22. I have modified Khvalynsk dates on human bone to account for the very high average  $^{15}\text{N}$  in human bone from Khvalynsk, which we measured at 14.8%, suggesting that an average  $-408 \pm 52$  radiocarbon years should be subtracted from these dates before calibrating them (see Authors Note on Dating, and chapter 7). After doing this I came up with dates for the Khvalynsk cemetery of 4700/4600–4200/4100 BCE, which makes it overlap with Sredni Stog, as many Ukrainian and Russian archaeologists thought it should on stylistic and typological grounds. It also narrows the gap between late Khvalynsk on the lower Volga (now 3600–3400 BCE) and earliest Yamnaya. See Agapov, Vasiliev, and Pestrikova 1990; and Rassamakin 1999.
23. Until Khvalynsk II is published, the figure of forty three graves is conditional. I was given this figure in conversation.
24. For the enhancement of male status with herding economies, see Holden and Mace 2003.
25. In Anthony and Brown (2000) we reported a smaller number of horses, cattle, and sheep from the cemetery at Khvalynsk, based on only the twelve “ritual deposits” placed above the graves. I later compiled the complete animal bone reports from two sources: Petrenko 1984; and Agapov, Vasiliev, and Pestrikova 1990, tables 1, 2. They presented conflicting descriptions of the numbers of sheep in ritual deposits 10 and 11, and this discrepancy resulted in a total count of either fifty-two or seventy sheep MNI.
26. See Ryndina 1998:151–159, for Khvalynsk I and II metals.
27. For ornaments see Vasiliev 2003.
28. For the possibility that the first domesticated animals came across the North Caucasus from the Near East, see Shnirelman 1992; and Jacobs 1993; and, in opposition, see Anthony 1994.
29. Yanushevich 1989.
30. Nalchik is described in Gimbutas 1956:51–53.
31. I found this grave referenced in Gei 2000:193.
32. The bones at Dzhangar were originally reported to contain domesticated cattle, but the zoologist Pavel Kosintsev told me, in 2001, that they were all onager and horse, with no obvious domesticates.
33. The Neolithic cultures of the North Caspian Depression, east of the Volga, were first called the Seroglazivka culture by Melent’ev (1975). Seroglazivka included some Neolithic forager camps similar to Dzhangar and later sites with domesticated animal bones like Varfolomieva. Yudin suggested in 1998 that a new label, “Orlovka culture,” should be applied to the Early Eneolithic sites with domesticated animals. On Varfolomieva, see Yudin 1998, 1988. Razdorskoe was described by Kiyashko 1987. Older but still informative is Telegin 1981.
34. The Orlovka site was first described by Mamontov 1974.
35. The Samara Neolithic culture, with the cemetery of S’yezzhe, usually is placed earlier than Khvalynsk, as one S’yezzhe grave contained a boars-tusk plaque exactly like a DDII type. Radiocarbon dates now indicate that early Khvalynsk overlapped with the late Samara Neolithic (and late DDII). The Samara Neolithic settlement of Gundurovka contained Khvalynsk pottery. The Samara culture might have begun before Khvalynsk; see Vasiliev and Ovchinnikova 2000. For S’yezzhe, see Vasiliev and Matveeva 1979. For animal bones, see Petrenko 1984:149; and Kuzmina 2003.

## CHAPTER 10. THE DOMESTICATION OF THE HORSE AND THE ORIGINS OF RIDING

1. See Clayton and Lee 1984; and Clayton 1985. For a recent update, see Manfredi, Clayton, and Rosenstein 2005.
2. For early descriptions of bit wear, see Clutton-Brock 1974; and Azzaroli 1980. Doubts about the causes of this kind of wear had been expressed by Payne (1995) in a study published after long delays.
3. We were provided with horse teeth by Mindy Zeder at the Smithsonian Institution; the Large Mammal Veterinary Facility at Cornell University; the University of Pennsylvania's New Bolton Veterinary Center; the Bureau of Land Management, Winnemucca, Nevada; and Ron Keiper of Pennsylvania State University. We learned mold-making and casting procedures from Sandi Olsen and Pat Shipman, then at Johns Hopkins University. Mary Littauer gave us invaluable advice and the use of her unparalleled library. Our first steps were supported by grants from the Wenner-Gren Foundation and the American Philosophical Society.
4. On horse MtDNA, see Jansen et al. 2002; and Vilà et al. 2001. For horse Y-chromosomes, see Lindgren et al. 2004.
5. For equids in Anatolia, see Summers 2001; and online reports on the Catal Höyük project. For horses in Europe, see Benecke 1994; and Peške 1986.
6. For Mesolithic and Neolithic Pontic-Caspian horses, see Benecke 1997; Vasiliev, Vybornov, and Komarov 1996; and Vasilev 1998. For horse bones at Ivanovskaya in the Samara Neolithic, see Morgunova 1988. In the same volume, see I. Kuzmina 1988.
7. For Mongol horse keeping, see Sinor 1972; and Smith 1984. For horses and cattle in the blizzard of 1886, see Ryden 1978:160–162. For feral horses see also Berger 1986.
8. For a review of these methods, see Davis 1987. For riding-related pathologies in vertebrae, see Levine 1999b. For crib-biting, see Bahn 1980; and the critique in White 1989.
9. The graphs from Benecke and von den Driesch (2003) are combined and reprinted as figure 10.3 here. See also Bökonyi 1974. For a critical view of Dereivka, see Uerpmann 1990.
10. The ratio of females to males in a harem band, counting immature horses, should be about 2:1, but the *skeletons* of immature males cannot be assigned a sex as the canine teeth do not erupt until about four to five years of age, and the presence of erupted canines is the principal way to identify males. From the bones, a harem band would contain just one *identifiable* male.
11. A horse's age at death can be estimated from a loose molar by measuring the molar crown height, the length of the tooth from the bifurcation between the roots to the occlusal surface. This measurement decreases with age as the tooth wears down. Spinage (1972) was the first to publish crown height-versus-age statistics for equids, based on zebras; Levine (1982) published statistics for a small sample of horses using measurements from X-rays. We largely confirmed Levine's numbers with direct measurements on our larger sample. But we found that estimates based *only* on crown heights have *at best* a ±1.5 year degree of uncertainty (a three-year span). The crown height on the right and left  $P_2$ 's of the same horse can vary by as much as 5 mm, which would normally be interpreted as indicating a difference in age of more than three years. See note 18, below.
12. Bibikova (1967, 1969) noted that fifteen of seventeen sexable mandibles were male. I subtracted the cult stallion, an Iron Age intrusion, making fourteen of sixteen males. Bibikova never published a complete description of the Dereivka horse bones, but she did note that the MNI was fifty-two individuals; 23% of the population was aged one to two years (probably looking at long bone fusion); fifteen of seventeen sexable jaw fragments were from males older than five, as this is when the canine teeth emerge; and there were no very old individuals.

Levine's age-at-death statistics were based on the crown heights of all the teeth kept in 1998, with an MNI of only sixteen—about two-thirds of the original collection had been lost. Only 7% of this remnant population was one to two years of age based on long-bone fusion (1999b:34) and about one-third of the surviving teeth were from the Iron-Age cult stallion. For Levine's age-at-death graphs, see Levine 1990, 1999a, 1999b.

13. The analysis of the equid P<sub>2</sub>s from Leisey was conducted by Christian George as part of his MA Thesis in Geosciences at the University of Florida. The 1.5-million-year-old Leisey equids were *Equus "leidyi,"* possibly an eastern variant of *Equus scotti*, a common member of the Rancholabrean fauna, very similar in dentition, diet and stature to true horses. Of the 113 P<sub>2</sub>s from this site, 39 were eliminated because of age, damage, or pathologies, leaving 74 measurable P<sub>2</sub>s from mature equids. See George 2002; Anthony, Brown, and George 2006; and Hulbert, Morgan, and Webb 1995. Our collection of P<sub>2</sub>s was assembled through the generosity of the New Bolton Center at the University of Pennsylvania, the Cornell University College of Veterinary Medicine, the Bureau of Land Management in Winnemucca, NE; and Ron Keiper, then at Pennsylvania State University.

14. We are grateful to the National Science Foundation for supporting the riding experiment, and to the State University of New York at Cobleskill for hosting and managing it. Dr. Steve MacKenzie supervised the project, and the riding and recording was done by two students in the Horse Training and Behavior Program, Stephanie Skargensky and Michelle Beleyea. The bone bit and antler cheekpieces were made with flint tools by Paul Trotta. The hemp rope was supplied by Vagn Noeddlund of Randers Ropeworks. Mary Littauer and Sandra Olsen provided valuable suggestions on bits and mold-making. All errors were our own.

15. The pre-experiment, never-bitted mean bevel measurement for the three horses bitted with soft bits was 1.1 mm, the same as the never-bitted Pleistocene Leisey equids. The standard deviation for the three was 0.42 mm. The post-experiment mean was 2.04 mm, more than two standard deviations greater than the pre-experiment mean. Another 300 hours of riding might have created a bevel of 3 mm, our threshold for archaeological specimens.

16. The 74 never-bitted equid teeth from Leisey exhibited a greater range of variation than the 31 never-bitted modern P<sub>2</sub>s we collected, not surprising with a larger sample. The distribution of measurements was normal, and a t-Test of the difference between the means for our bitted sample and the Leisey sample showed a significant difference. The threshold of 3 mm for identifying bit wear in archaeological specimens is supported by the Leisey data.

17. Levine outlined six problems with our bit wear studies in 1999b:11–12 and 2004:117–120. She placed it in a category she termed “false direct evidence,” with so-called bridle cheekpieces whose forms vary wildly and whose function is entirely speculative. We believe Levine's criticisms are based on factual errors, distortions, and misunderstandings. For our reply to each of her six criticisms, see Anthony, Brown, and George 2006. We remain confident in our analysis of bit wear.

18. Permanent horse P<sub>2</sub>s become flattened or “tabled” by occlusion with the opposing tooth gradually between two and three years of age. Brown determined that a P<sub>2</sub> with a crown height greater than 5.0 mm *and* an occlusal length-to-width ratio greater than 2.1 is probably from a horse three years old or younger, so should be excluded from studies of bit wear (Brown and Anthony 1998:338–40). Brown was the first to combine the crown height and the occlusal length-width ratio to produce an age-at-death estimate this precise. If she had not done this we would have been forced to discard half of our sample to avoid using 2–3-year-old teeth. Christian George also used Brown's method to eliminate young teeth ( $\leq 3$  yr) from the Leisey sample. It should be noted that George found one P<sub>2</sub> with a bevel of 3.05 mm, but it was probably from a horse less than three years old.

19. Bendrey (2007), as this book went to press, reported new bevel measurements on never-bitted Przewalski horses, from zoos in England and Prague. Bendrey measured 29 P<sub>2</sub>s from 15 Przewalski horses of acceptable age (>3 and <21), and found 3mm bevels on three, or 10%. We found one bevel of *almost* 3mm in 105 never-bitted P<sub>2</sub>s, less than 1%. The Przewalski bevels all

were caused by malocclusion with the opposing upper P<sup>2</sup>; one 3mm bevel was filed down as a veterinary treatment for underbite. Maloclusion occurred among zoo-kept Przewalskis more frequently than among Pleistocene equids or Nevada mustangs. All zoo Przewalskis are descended from about 15 captured in the wild, and these founders might have had unusually bad occlusion. Also domestic horses were bred with the founders, perhaps mixing genes for different tooth and jaw sizes.

20. Raulwing 2000:61, with references.
21. For Dereivka, see Telegin 1986. For the horse bones, see Bibikova 1967, 1970; Bökönyi 1974, 1978, 1979; and Nobis 1971.
22. For criticisms of the traditional evidence for horse domestication at Dereivka, see Anthony 1986, 1991b; and Levine 1990.
23. Our research at the Institute of Zoology in Kiev was hosted by a generous and thoughtful Natalya Belan; in Samara, Russia, by Igor Vasiliev; and in Petropavlovsk, Kazakhstan, by Victor Zaibert. In Budapest Sandor Bökönyi made us welcome in the gracious manner for which he was widely known and is widely missed. The project was supported by a grant from the National Science Foundation. For reports, see Anthony and Brown 1991; and Anthony, Telegin, and Brown 1991.
24. See Häusler 1994.
25. For the redating of the Dereivka cult stallion, see Anthony and Brown 2000; reiterated in Anthony and Brown 2003.
26. Both Botai and Tersek showed some influence in their ceramics from forager cultures of the forest-steppe zone in the southeastern Urals, known as Ayatskii, Lipchin, and Surtanda. Botai-Tersk might have originated as a southern, steppe-zone offshoot of these cultures. For a description of Botai and Tersek in English, see Kislenko and Tatarintseva 1999; in Russian, see Zaibert 1993. For discussions of the horse remains at Botai and related sites, see Olsen 2003; and Brown and Anthony 1998.
27. Our initial measurements of the horse teeth from Kozhai 1 (made in a hotel room in Petropavlovsk, Kazakhstan) produced one tooth with a 3 mm bevel. This is how we described the Kozhai results before 2006. We remeasured the twelve Kozhai 1 casts for Anthony, Brown, and George 2006, and agreed that a borderline 2.9+ measurement was actually 3 mm, resulting in two teeth with bit wear. Two other P<sub>2</sub>s from Kozhai 1 measured 2 mm or more, an unusually high measurement among wild horses.
28. Describing the Botai horses as wild were Levine 1999a, 1999b; Benecke and von den Dreisch 2003; and Ermolova, in Akhinzhalov, Makarova, and Nurumov 1992.
29. See Olsen 2003:98–101.
30. French and Kousoulakou 2003:113.
31. The Atbasar Neolithic preceded Botai in the northern Kazakh steppes; see Kislenko and Tatarintseva 1999. Benecke and von den Dreisch (2003: table 6.3) reported that domesticated sheep and cattle bones were found in Atbasar sites in the Kazakh steppes, dated before Botai. This is true, but the Russian and Kazakh authors they cite described the bones of domesticated sheep and cattle as later intrusions in the Neolithic levels; they were less weathered than the bones of the wild animals. The animal bones from Atbasar sites are interpreted by Akhinzhalov, Makarova, and Nurumov as indicating a foraging economy based on wild horses, short-horned bison, saiga antelope, gazelle, red deer, and fish. Domesticated animals appeared at the end of the Botai era. For their comments on differential bone weathering in Atbasar sites, see Akhinzhalov, Makarova, and Nurumov 1992:28–29, 39.
32. Logvin (1992) and Gaiduchenko (1995) interpreted some animal bones in sites of the Eneolithic Tersek culture, centered in the Tugai steppes near Kustenai, Kazakhstan, and dated to the same period as Botai, as domesticated cattle, particularly from Kumkeshu I. Another zoologist, Makarova, had identified the Tersek bovid bones as those of wild bison (Akhinzhalov, Makarova, and Nurumov 1992:38). Some domesticated cattle might have been kept in Tersek sites, which were closer to the Pontic-Caspian herders. None appeared at Botai. For Kumkeshu I, see Logvin, Kalieva, and Gaiduchenko 1989.

33. For horses in the Caucasus I relied on the text of a conference paper by Mezhlumian (1990). A few horses might have passed through the Caucasus into northern Iran before 3000 BCE, indicated by a few probable horse teeth at the site of Qabrestan, west of Teheran (see Mashkour 2003) and a possible horse tooth at Godin Tepe (see Gilbert 1991). No definite horse remains have been identified in eastern Iran, Central Asia, or the Indian subcontinent in deposits dated earlier than 2000 BCE, claims to the contrary notwithstanding. For a review of this debate, see Meadow and Patel 1997.
34. For central European horses, see See Benecke 1994; Bökonyi 1979; and Peške 1986.
35. Khazanov 1994:32.
36. For war and the prestige trade, see Vehik 2002.
37. The American Indian analogy is described in Anthony 1986. The most detailed analysis of the effects of horseback riding and horse keeping on Plains Indian cultures is Ewers 1955.
38. One argument against riding before 1500 BCE was that steppe horses were too small to ride. This is not true. More than 70% of the horses at Dereivka and Botai stood 136–144 cm at the withers, or about 13–14 hands high, and some were 15 hands high. They were the same size as Roman cavalry horses. Another argument is that rope and leather bits were inadequate for controlling horses in battle. This is also not true, as the American Indians demonstrated. Our SUNY students at Cobleskill also had “no problem” controlling horses with rope bits. The third is that riders in the steppes rode sitting back on the rump of the horse, a manner suited only to riding donkeys, which did not exist in the steppes. We have rebutted these doubts about Eneolithic riding in Anthony, Brown, and George 2006. For the arguments against Eneolithic riding, see Sherratt 1997a:217; Drews 2004:42–50; Renfrew 2002; and E. Kuzmina 2003:213.
39. The remains of a bow found in Berezovka kurgan 3, grave 2, on the Volga, in a grave of Pokrovka type probably dated about 1900–1750 BCE, had bone plates reinforcing the shaft and bone tips at the ends—a composite bow. The surviving pieces suggest a length of 1.4–1.5 m, almost five feet from tip to tip. See Shishlina 1990; and Malov 2002. For an overview of early archery and bows, see Zutterman 2003.
40. I am indebted to Dr. Muscarella for some of these ideas about arrow points. For a discussion of the initial appearance and usage of socketed bronze arrowheads, see Derin and Muscarella 2001. For a catalogue and discussion of the early Iron Age socketed arrowheads of the Aral Sea region, see Itina and Yablonskii 1997. Socketed bronze spear points were made in the steppes as early as 2000 BCE, and smaller socketed points began to appear occasionally in steppe sites about the middle of the Late Bronze Age, around 1500 BCE, but their potential was not immediately exploited. The ideal bows, arrows, and arrowheads for mounted archery evolved slowly.
41. For tribal warfare, see Keeley 1996.

## CHAPTER 11. THE END OF OLD EUROPE AND THE RISE OF THE STEPPE

1. For the gold at Varna, see Bailey 2000:203–224; Lafontaine and Jordanov 1988; and Eleure 1989.
2. Chapman 1989.
3. For off-tell settlement at Bereket, see Kalchev 1996; at Podgoritsa, see Bailey et al. 1998.
4. The decrease in solar insolation that bottomed out at 4000–3800 BCE is documented in Perry and Hsu 2000; and Bond et al. 2001. For the Piora Oscillation in the Swiss Alps, see Zöller 1977. For indicators of cooling in about 4000 BCE in the Greenland ice cores, see O’Brien et al. 1995. For climate change in Central Europe in the German oak tree rings, see Leuschner et al. 2002. For the Pontic steppes, see Kremenetski, Chichagova, and Shishlina 1999.
5. For the flooding and agricultural shifts, see Bailey et al. 2002. For overgrazing and soil erosion, see Dennell and Webley 1975.

6. For Jilava, see Comsa 1976.
7. The pollen changes are described in Marinova 2003.
8. Cast copper objects began to appear regularly in western Hungary with the Lasinja-Balaton culture at about 4000 BCE; see Bánffy 1995; also Parzinger 1992.
9. Todorova 1995:90; Chernykh 1992:52. The burning of houses might have been an intentional ritual act during the Eneolithic; see Stevanovic 1997. But the final fires that consumed the Eneolithic towns of the lower Danube valley and the Balkans about 4000 BCE were followed by region-wide abandonment and abrupt culture change. Region-wide abandonments of large settlements in the North American Southwest (1100–1400 CE) and in Late Classic Maya sites (700–900 CE) in Mesoamerica were associated with intense warfare; see Cameron and Tomka 1993. The kind of climate shift that struck the lower Danube valley about 4100–3800 BCE would not have made tell settlements uninhabitable. Warfare therefore seems a likely explanation.
10. For evidence of overgrazing and soil erosion at the end of the Karanovo VI period, see Dennell and Webley 1975; for the destruction of Eneolithic Yunatsite, see Merpert 1995; and Nikolova 2000.
11. Todorova 1995.
12. See Ellis 1984 for ceramic workshops, and Popov 1979 for flint workshops. I use the Russian spelling (Tripolye, Tomashovka) rather than the Ukrainian (Tripil'ye, Tomashivka), because many site names such as Tripolye are established in the literature outside Ukraine in their Russian spelling.
13. On the demographics, see Dergachev 2003; and Masson 1979. On the flight of Bolgrad-Aldeni refugees, see Sorokin 1989.
14. On Tripolye B1 warfare generally, see Dergachev 2003, 1998b; and Chapman 1999. On Drutsy 1, see Ryndina and Engovatova 1990. For much of the other information in this section I have relied on the review article by Chernysh 1982.
15. The Cucuteni C designation refers only to a type of shell-tempered pottery. The Cucuteni chronology ends with Cucuteni B<sub>2</sub>, Cucuteni C ware appeared first in sites dated to the Cucuteni A<sub>3</sub>/Tripolye B1 period and ultimately dominated ceramic assemblages. See Ellis 1984:40–48.
16. The source of the steppe influence on Cucuteni C pottery is usually identified as the early Sredni Stog culture, phase Ib, for Telegin; or the Skelya culture, for Rassamakin.
17. Shell-temper adds to the durability and impact resistance of vessels that are regularly submitted to thermal shock through reheating, and also increases the cooling effect of evaporation, making a shell-tempered pot good for cooking or storing cool drinking water. Cucuteni C ware and fine painted wares were found together both in pit-houses and large two-storyed surface houses. Contextual differences in the distribution of Cucuteni C ware and fine ware in settlements have not been described. At some sites the appearance of Cucuteni C wares seems abrupt: Polivanov Yar had traditional grog-tempered coarse wares in the Tripolye B2 occupation but switched to shell-tempered C wares of different shapes and designs in Tripolye C1, whereas the fine painted wares showed clear continuity between the two phases. See Bronitsky and Hamer 1986; Gimbutas 1977; and Marinescu-Bilcu 1981.
18. For the horse-head maces see Telegin et al. 2001; Dergachev 1999; Gheorgiu 1994; and Govedarica and Kaiser 1996.
19. For the skull shapes, see Necrasov 1985; and Marcsik 1971. Gracile “Mediterranean” Tripolye skulls have been found in ritual foundation deposits at Traian (Tripolye B2).
20. For Mirnoe, see Burdo and Stanko 1981.
21. For the eastern migration, see Kruts and Rizhkov 1985.
22. The Iron Age stereotype of nomadic cavalry seems to lie behind some of the writings of Merpert (1974, 1980) and Gimbutas (1977), who were enormously influential.
23. The “awkward seat” hypothesis is based on Near Eastern images that show riders sitting awkwardly on the horse's rump, a seat more suited to donkey riding. Donkeys have low withers

and a high, broad rump. If you sit forward on a donkey and the animal lowers its head, you can easily fall forward to the ground. Donkey riders, therefore, usually sit back on the rump. Horses have high withers, so horse riders sit forward, which also permits them to hang onto the mane. You have to push and lift to get yourself onto a horse's rump, and then there's nothing to hold on to. Artistic images that show riders on horseback sitting back on the rump probably indicate only that many Near Eastern artists before 1000 BCE, particularly in Egypt, were more familiar with riding donkeys than horses. The suggestion that riders in the steppes would adopt and maintain a donkey seat on horses is inherently implausible. See Drews 2004:40–55, for this argument.

24. For mutualism and economic exchanges between Old Europe and the Eneolithic cultures of the Pontic steppe, see Rassamakin 1999:112; see also Manzura, Savva, and Bogotay 1995; and Nikolova 2005:200. Nikolova has argued that transhumant pastoralism was already part of the Old European economy in Bulgaria, but the Yagodinska cave sites she cited are radiocarbon dated about 3900 BCE, during or just after the collapse. Upland pastoral settlements were a small and comparatively insignificant aspect of the tell economies, and only a serious crisis made them the basis for a new economy.

25. Ewers 1955:10.

26. See Benveniste 1973:53–70, for *Give* and *Take*, esp. 66–67 for the Hittite terms; for the quotation, see 53. Hittite *pai* was derived from the preverb *pe-* with \**ai-*, with reflexives meaning “give” in Tocharian *ai-*. Also see the entry for *Give* in Mallory and Adams 1997:224–225.

27. See Keeley 1996. For mutualist models of the Linear Pottery frontier, see Bogucki 1988. An ethnographic case frequently cited in discussions of mutualist food exchange is that of the horticultural Pueblo Indians and the pedestrian buffalo hunters of the Plains. But a recent study by Susan Vehik suggested that the Pueblo Indians and the Plains bison hunters traded prestige commodities—flint arrowheads, painted pottery, and turquoise—not food. And during a period of increasing conflict in the Plains after 1250 CE, trade actually greatly increased; see Vehik 2002.

28. See Kershaw 2000.

29. See “bride-price” in Mallory and Adams 1997:82–83.

30. In East Africa a group of foragers and beekeepers, the Mukogodo, were forced to obtain livestock after they began to interact and intermarry with stock-raising tribes, because it became impossible for Mukogodo men to obtain wives by offering beehives when non-Mukogodo suitors offered cattle. Cattle were just more valuable. The Mukogodo became pastoralists so that they could continue to have children. See Cronk 1989, 1993.

31. Ewers 1955:185–187.

32. The Sredni Stog site had two levels, Sredni Stog 1 and 2. The lower level (Sredni Stog 1) was an Early Eneolithic DDII occupation, and the upper was the type site for the Late Eneolithic Sredni Stog culture. In older publications the Sredni Stog culture is sometimes called Sredni Stog 2 (or II) to differentiate it from Sredni Stog 1 (or I).

33. The Sredni Stog culture is defined in Telegin 1973. The principal settlement site of the Sredni Stog culture, Dereivka, is described in English in Telegin 1986; for the Sredni Stog origin of Cucuteni C ware, see 111–112. Telegin's chronological outline is described in English in Telegin 1987.

34. The longest and most detailed version of Rassamakin's new model in English is the 123-page article, Rassamakin 1999. Telegin's four phases (Ia, Ib, IIa, IIb) of the Sredni Stog culture represented, for Rassamakin, at least three separate and successive cultures: (1) the Skelya culture, 4500–4000 BCE (named for Strilcha Skelya, a phase Ib Sredni Stog site for Telegin); (2) the Kvityana culture, 3600–3200 BCE (Kvityana was a phase Ia site for Telegin, but Rassamakin moved it to the equivalent of Telegin's latest phase IIb); and (3) the Dereivka culture, 3200–3000 BCE (a phase IIa site for Telegin, dated 4200–3700 BCE by radiocarbon). Telegin seemed to stick to the stratigraphy, grave associations, and radiocarbon dates, whereas Rassamakin relied on stylistic arguments.

35. For Sredni Stog ceramics, see Telegin 1986:45–63; 1973:81–101. For skeletal studies, see Potekhina 1999:149–158.

36. For the seeds at Molukh Bugor, see Pashkevich 1992:185. For the tools at Dereivka, see Telegin 1973:69, 43. Bibikova actually reported 2,412 horse bones and 52 horse MNI. I have edited out the mandible, skull, and two metacarpals of the “cult stallion.”

37. Only four settlement animal bone samples are reported for Sredni Stog. Most of them are worryingly small (a few hundred bones) and screens were not used in excavations (still are not), so bone recovery varied between excavations. For these reasons, the published animal bone percentages can be taken only as rough guides. For an English translation of the faunal reports, see Telegin 1986.

38. Rassamakin (1999:128) assigned the Dereivka cemetery, which he called Dereivka 2, to the Skelya period, before 4000 BCE, and assigned the Dereivka settlement to the Late Eneolithic, around 3300–3000 BCE. Telegin, following the radiocarbon dates from the settlement and the Tripolye B2 bowl found in the cemetery, assigned both to the same period.

39. See Dietz 1992 for the varied interpretations of antler “cheekpieces.”

40. For the Suvorovo-Novodanilovka group, see Nechitailo 1996; and Telegin et al. 2001. The metals are analyzed in Ryndina 1998:159–170; for an English summary, see 194–195. English-language discussions of the Suvorovo-Novodanilovka group are few. In addition to Rassamakin’s description of the Skelya culture, which incorporates Suvorovo-Novodanilovka, see Dergachev 1999; and Manzura, Savva, and Bogotaya 1995. And there is a useful entry under “Suvorovo” in Mallory and Adams 1997.

41. Telegin 2002, 2001.

42. The physical type in Novodanilovka graves is discussed in Potekhina 1999:149–154. The types of the lower Danube valley are described by Potekhina in Telegin et al. 2001; and in Necrasov and Cristescu 1973.

43. Ryndina (1998:159–170) examined copper objects from graves at Giugurlești, Suvorovo, Novodanilovka, Petro-Svitunovo, and Chapli. For the copper of Varna and Gumelnitsa, see Pernicka et al. 1997. They document the end of the Balkan mines and the switch to Carpathian ores at about 4000 BCE.

44. The horse-head examples in the Volga steppes were found at Novoorsk near Orenburg and at Lebyazhinka near Samara. For the polished stone mace heads, see Kriukova 2003.

45. For Old European weapons, see Chapman 1999.

46. *Equus hydruntinus* had a special ritual status in the cemeteries of Varna and Durankulak, but was unimportant in the diet and was on the brink of extinction. Horses (*Equus caballus*) were rare or absent in the Eneolithic settlements and cemeteries of the Danube valley before the Cernavoda I period, except for sites of the Bolgrad variant. The Gumeñița-related Bolgrad sites had about 8% horse bones. Other Old European sites in the Danube valley had few or no horses. For the Varna and Durankulak equids, see Manhart 1998.

47. See Vehik 2002 on increased warfare and long-distance trade in the Southwest. DiCosmo (1999) observed that increased warfare in the steppes encouraged organizational changes in preexisting institutions, and these changes later made large nomadic armies possible.

48. Contacts between late Tripolye A/early B1 settlements and the Bolgrad culture are summarized in Burdo 2003. Most of the contact is dated to late Tripolye A—Tripolye AIIIA2 and IIIA3.

49. For Bolgrad sites, see Subbotin 1978, 1990.

50. For the intrusive cemeteries, see Dodd-Oprițescu 1978. For the gold and copper hoards, see Makkay 1976.

51. For the Suvorovo kurgan group, see Alekseeva 1976. The Kopchak kurgan is described in Beilekchi 1985.

52. Giuriulești is described briefly in Haheu and Kurciatov 1993. One radiocarbon date is published from Giuriulești: Ki-7037, 5380±70 BP, or about 4340–4040 BCE, calibrated; I have been told that the date is misprinted in Telegin et al. 2001, 128.

53. The Novodanilovka grave, which was isolated and not in a cemetery, is described in Telegin 1973:113; for Petro-Svistunovo and Chapli, see Bodians'kii 1968; and Dobrovols'ki 1958.

54. The region-wide abandonment of tells in about 4000–3500 BCE is observed in Coleman 2000. I do not see how this could have been the event that brought Greek speakers into Greece, because Greek shared many traits with the Indo-Iranian language branch (see the end of chapter 3), and Indo-Iranian emerged much later. The crisis of 4000 BCE probably brought Pre-Anatolian speakers into southeastern Europe.

55. See Madgearu 2001 on de-urbanization in post-Roman Bulgaria. Mace (1993) notes that if grain production falls, cattle are insurance against starvation. Cattle can be moved into a protected area during a period of conflict. Under conditions of declining agricultural yields and increasing conflict, a shift to a greater reliance on herding would make good economic sense.

56. For loot, lucre, and booty in Proto-Indo-European, see Benveniste 1973:131–137; for language shift among the Pathan, see Barth 1972.

57. For Cernavoda I, see Morintz and Roman 1968; and Roman 1978; see also Georgieva 1990; Todorova 1995; and Ilčeva 1993. A good recent summary is in Manzura 1999. For the cemetery of Ostrovul Corbului, see Nikolova 2002, 2000.

58. Sherratt 1997b, 1997c. Sherratt suggested that the drinking vessels of the period from 4000 to 2500 BCE were used to serve a beverage that included honey (the basis of mead) and grain (the source of beer), both directly attested in Early Bronze Age Bell Beaker cups. Honey, he suggested, would have been available only in small quantities, and might have been under the control of an elite who apportioned the fermented drink in ceremonies and closed gatherings open to just their inner circle. Proto-Indo-European contained a word for honey (*\*melit-*) and a derivative term for a honey drink (*\*medhu-*).

59. For Cernavoda I–Late Lengyel horses, see Peške 1986; and Bökönyi 1979.

60. For pastoralism, see Greenfield 1999; Bökönyi 1979; and Milisauskas 2002:202.

61. For the prayer to Sius, see Puhvel 1991.

## CHAPTER 12. SEEDS OF CHANGE ON THE STEPPE BORDERS

1. Ryndina (1998:170–171) counted 79 copper objects from steppe graves for the Post-Suvorovo period, compared to 362 for Suvorovo–Novodanilovka graves.

2. See Telegin 2002, 1988, 1987; see also Nikolova and Rassamakin 1985; and Rassamakin 1999. Early reports on Mikhailovka are Lagodovskaya, Shaposhnikova, and Makarevich 1959; Shaposhnikova 1961 (this was the article where the division between lower and upper stratum 2 was noticed); and Shevchenko 1957. For the stratigraphic position of Lower Mikhailovka graves, see Cherniakov and Toshchev 1985. Radiocarbon dates for graves with Mikhailovka I pottery are reported in Videiko and Petrenko 2003. Early Mikhailovka II begins about 3500 BCE, in Kotova and Spitsyna 2003.

3. For the Maikop sherd at Mikhailovka I, see Nechitailo 1991:22. For the other pottery exchanges, see Rassamakin 1999:92; and Telegin 2002:36.

4. Pashkevich 2003.

5. The sheep of the Early Bronze Age in southeastern Europe were significantly larger than Eneolithic sheep, which Bökönyi (1987) attributed to a new breed of wool sheep that appeared after about 3500 BCE.

6. At the Cernavoda site three excavation areas yielded three successive archaeological cultures, of which the oldest was Cernavoda I, about 4000–3600 BCE; next was Cernavoda III, about 3600–3000 BCE, contemporary with Baden; and the youngest was Cernavoda II, 3000–2800 BCE. Mikhailovka I probably was contemporary with the end of Cernavoda I and the first half of Cernavoda III. See Manzura, Savva, and Bogatoya 1995.

7. For Mikhailovka I graves at Olaneshti, see Kovapenko and Fomenko 1986; and for Sokolovka, see Sharafutdinova 1980.
8. Potekhina 1999:150–151.
9. “Post-Mariupol” was the label first assigned by Kovaleva in the 1970s. See Nikolova and Rassamakin 1985; Telegin 1987; and Kovaleva 2001.
10. See Ryndina 1998:170–179, for Post-Mariupol metal types.
11. The two graves were Verkhnaya Maevka XII k. 2, gr. 10; and Samarska k.1, gr. 6 in the Orel-Samara region. See Ryndina 1998:172–173.
12. For Razdorske, see Kiyashko 1987, 1994.
13. The percentage of horse bones at Repin is often said to be 80%. Shilov (1985b) reviewed the numbers and came up with 55% horse bones, still a very high number.
14. For Repin/Yamnaya at Cherkasskaya, see Vasiliev and Siniuk 1984:124–125.
15. For Kara Khuduk and Kyzyl-Khak, see Barynkin and Vasiliev 1988; for the fauna, see I. Kuzmina 1988. Also see Ivanov and Vasiliev 1995; and Barynkin, Vasiliev, and Vybornov 1998. For the radiocarbon dates for Kyzyl Khak, see Lavrushin, Spiridonova, and Sulerzhitskii 1998:58–59. For late Khvalynsk graves on the lower Volga, see Dremov and Yudin 1992; and Klepikov 1994.
16. Kruts typed the Chapaevka ceramics as late Tripolye C1, whereas Videiko described Chapaevka as a late Tripolye B2 settlement. See Kruts 1977; and Videiko 2003. Videiko argued that ceramic craft traditions changed at different rates in different settlement groups. Tripolye B2 stylistic habits lingered longer, he suggested, in the Dnieper group (Chapaevka) than they did in the super-settlements of the South Bug group, which shifted to Tripolye C1 styles earlier. Tripolye C2 styles began on the Dniester at Usatovo about 3400–3300 BCE, but Tripolye C2 styles appeared on the Dnieper about 3100 BCE.
17. Kruts 1977:48.
18. For the super-sites, see Videiko 1990, and other articles in the same volume; also see Shmagli and Videiko 1987 and Kohl 2007.
19. At Maidanets’ke, emmer and spelt wheats were the most common cereals recovered; barley and peas also were found in one house. Cattle (35% of domesticates, MNI) were the most important source of meat, with pig (27%) and sheep (26%) as secondary sources; the remaining 11% was equally divided between dogs and horses. About 15% of the animals were red deer, wild boar, bison, hare, and birds. The cattle, pigs, and abundant wild animals indicate substantial forest near the settlement. A forest of about 20  $\text{km}^2$  would have provided sufficient firewood for the town, figuring about 2.2 ha of hardwood forest per family of five for a sustainable woodlot. Since ecological degradation is not obvious, the abandonment of the town perhaps was caused by warfare. See Shmagli and Videiko 1987:69, and several articles on economy in the volume cited above as Videiko 1990.
20. The Tripolye B1 settlement of Polivanov Yar on the Dniester overlooked outcrops of high-quality flint. One house was engaged heavily in flint working, with all stages of the tool-making process. In the later Tripolye C1 settlement, all six excavated structures were engaged in flint working, the initial shaping occurred elsewhere, and new products were made (heavy flint axes and chisels about 10 cm long). The Tripolye C1 settlement had become a specialized village of flint workers. Maidanets’ke imported finished flint tools of Dniester flint, probably from Polivanov Yar. At Veseli Kut (150 ha), a Tripolye B2 town east of the South Bug valley, two structures were identified as ceramic workshops. Eight buildings dedicated to ceramic production were found at Varvarovka VIII (40 ha and 200 houses—the largest town in its region), and a similar ceramic factory appeared at Petreni on the Dniester, again the largest town in its area. At Maidanets’ke, eight houses in a row contained looms (indicated by clusters of up to seventy ceramic loom weights) and some had two looms, perhaps a specialized weaver’s quarter. For Polivanov Yar, see Popova 1979; for ceramic workshops, see Ellis 1984.
21. For the Uruk expansion, see Algaze 1989; Stein 1999; and Rothman 2001. For copper production at Hacinebi, see Özbal, Adriaens, and Earl 2000; for the copper of Iran, see Matthews and Fazeli 2004. For the wool sheep, see Bökonyi 1983; and Pollack 1999.

22. For Sos and Berikldeebi, see Kiguradze and Sagona 2003; and Rothman 2003.
23. The Maikop-like pottery was found in pre-Kura-Araxes levels at Berikldeebi. Early Maikop began before the Early Transcaucasian Culture. See Glonti and Dzhavakhishvili 1987.
24. For pre-Maikop Svobodnoe, see Nekhaev 1992; and Trifonov 1991. For steppe-Svobodnoe exchanges, see Nekhaev 1992; and Rassamakin 2002.
25. The poses of those buried in the Maikop chieftain's grave were not clear. For an English-language description of the Maikop culture, see Chernykh 1992:67–83. Quite dated accounts are Childe 1936; and Gimbutas 1956:56–62. A long, detailed description in Russian is in Munchaev 1994. For the Novosvobodnaya graves, see Rezepkin 2000. For the archaeological culture history in the North Caucasus, see Trifonov 1991.
26. For the silver and gold staff casings with bulls, see Chernopitskii 1987. The 47-cm length of the riveted copper blade is emphasized in Munchaev 1994:199.
27. Rostovtseff (1922:18–32) argued that Maikop was a Copper Age or, in Anatolian terms, a Late Chalcolithic culture. But Maikop became established as a North Caucasian Bronze Age culture, so it begins somewhat earlier than the Anatolian Bronze Age to which it was originally linked. Some Russian archaeologists now suggest an early Maikop phase that would be Late Eneolithic, whereas later Maikop would remain Early Bronze Age. For Maikop chronology, see Trifonov 1991, 2001. For my own mistaken chronology, see Glumac and Anthony 1992. I should have believed Rostovtseff.
28. For the east Anatolian seal, see Nekhaev 1986; and Munchaev 1994:169, table 49:1–4.
29. For Galugai, see Korenevskii 1993, 1995; the fauna is described in 1995:82. Korenevskii considered Galugai a pioneer settlement by migrants from Arslantepe VIA. For Maikop horses, see Chernykh 1992:59.
30. Rezepkin (1991, 2000) argued that Maikop and Novosvobodnaya were separate and contemporary cultures. Similar radiocarbon dates from Galugai (Maikop) and Klady (Novosvobodnaya) suggested this. But the radiocarbon dates for Galugai are on charcoal and those from Klady are on human bone, which might be affected by old carbon in fish if the Klady people ate a lot of fish. Adjusted for a  $^{15}\text{N}$  content of 11%, which would be at the low end of the levels known in the steppes, the *oldest* Klady dates might drop from about 3700–3500 to about 3500–3350 BCE. I follow the traditional view and represent Novosvobodnaya as an outgrowth of Maikop. Rezepkin compared Novosvobodnaya pottery to TRB or Funnel Beaker pottery from Poland, and megalithic porthole graves at Klady to TRB dolmen porthole graves. He suggested that Novosvobodnaya began with a migration from Poland. Sergei Korenevskii (1993) tried to bring the two phases back into a single culture. Black burnished pottery is found in central Anatolia at Late Chalcolithic and at EBI sites such as Kösk Höyük and Pinarbaşı, a closer alternative source.
31. Shishlina, Orfinskaya, and Golikov 2003.
32. See Kiguradze and Sagona 2003:89, for the beads at Alikemek Tepesi.
33. The Maikop–Novosvobodnaya connections of the Sé Girdan kurgans were noticed by A. D. Rezepkin and B. A. Trifonov; both published Russian-language articles describing these connections in 2000. These were brought to Muscarella's attention in 2002 by Elena Izbitser at the Metropolitan Museum of Art in New York. Muscarella (2003) reviewed this history.
34. For the symbolic power of long-distance trade, see Helms 1992. For primitive valuables, see Dalton 1977; and Appadurai 1986.
35. For the Novosvobodnaya wagon grave, see Rezepkin and Kondashov 1988:52.
36. Shilov and Bagautdinov 1998.
37. See Nechitailo 1991, for Maikop–steppe contacts. Rassamakin (2002) suggested that Late Tripolye migrants of the Kasperovka type influenced the formation of the Novosvobodnaya culture.
38. Cannabis might have been traded from the steppes to Mesopotamia. Greek *kannabis* and Proto-Germanic \**hanipiz* seem related to Sumerian *kunibū*. Sumerian was dead as a widely

spoken language by about 1700 BCE, so the connection must have been a very ancient one, and the international trade of the Late Uruk period provides a suitable context; see Sherratt 2003, 1997c. Wine could have been a linked commodity; the Greek, Latin, Armenian, and Hittite roots for “wine” are cognates, and some linguists feel that the root was of Semitic or Afro-Asiatic origin. See Hock and Joseph 1996:513.

39. For Caucasian horses, see Munchaev 1982; Mezhlumian 1990; and Chernykh 1992:59. For Noršuntepe and Anatolia, see Bökönöyi 1991.

## CHAPTER 13. WAGON DWELLERS OF THE STEPPE

1. For climate change at the beginning of the Yamnaya period, see Kremenetski 1997b, 2002.

2. The *\*ghos-ti-* root survived only in Italic, Germanic, and Slavic, but the institution was more widespread. See Benveniste 1973:273–288 on *Philos*, and entries in Mallory and Adams 1997 on *guest* and *friend*. Ivanov suggested that Luwian *kaši*- ‘visit’ might possibly be cognate with Proto-Indo-European *\*ghos-ti-*, but the relationship was unclear. See Gamkrelidze and Ivanov 1995:657–658, for their discussion of *hospitality*. In later Indo-European societies, this institution was critical for the protection of merchants and visiting elites or nobles; see Kristian sen and Larsson 2005:236–240. See also Rowlands 1980.

3. As Mallory has noted, the eastern Indo-European branches did have some agricultural vocabulary. The eastern Indo-Europeans talked about plowed fields, grain, and chaff. The archaeological contrast between east and west is more extreme than the linguistic one, which perhaps reflects the difference between what people knew and could talk about (language) and how they actually behaved most of the time (archaeology). See entries on *agriculture*, *field*, and *plow* in Mallory and Adams 1997.

4. For the feminine gender as one of the ten innovations distinguishing classic Proto-Indo-European from the archaic form preserved in Anatolian, see Lehrman 2001. For the Afro-Asiatic loans in western Indo-European, see Hock and Joseph 1996:513. For Rudra’s female consorts, see Kershaw 2000:212.

5. Gimbutas 1956:70ff. I would never have thought it possible to penetrate the archaeology of Eastern Europe had it not been for this pioneering English-language synthesis, which opened the door. Nevertheless, I soon began to disagree with her; see Anthony 1986. I was very pleased to spend a few days with her in 1991 at a National Endowment for the Humanities conference in Austin, Texas, organized by Edgar Polomé.

6. The hundred-year anniversary of Gorodtsov’s 1903 archaeological expedition on the Northern Donets River was celebrated by three conferences on the Bronze Age (or at least three were planned). The first conference was in Samara in 2001, and the proceedings make a valuable primer on the Bronze Age cultures of the steppes. See Kolev et al. 2001.

7. See Merpert 1974:123–146, for the Yamnaya “cultural-historical community.”

8. This steppe-pine-forest vegetation community is designated number 19 in the Atlas SSSR, 1962, edited by S. N. Teplova, 88–89. It occurs both in the lowland and mountain steppe environments.

9. Afanasievo radiocarbon dates are listed in table 13.3. Most of the Afanasievo dates appear to be on wood from the graves, but some are on human bone. Although I have not seen  $^{15}\text{N}$  measurements for Afanasievo individuals, later skeletons from graves in the Altai had  $^{15}\text{N}$  levels of 10.2 to 14.3%. Applying the correction scale I am using in this book, the Afanasievo dates taken on bone might be too old by 130 to 375 radiocarbon years. I have not corrected them, because, as I said, most appear to have been measured on samples of wood taken from graves, not human bone.

10. V. N. Logvin (1995) noted that some undated flat-grave cemeteries in northern Kazakhstan might represent a short-lived mixture of early Yamnaya or Repin and Botai-Tersek people. For the Karagash kurgan, see Evdokimov and Loman 1989.

11. The pottery in the earliest Yamnaya graves in the Volga-Ural region (Pokrovka cemetery I, k. 15, gr. 2; Lopatino k. 1, gr. 31; Gerasimovka II, k. 4, gr. 2) was Repin-influenced; and the pottery in the earliest Afanasievo kurgans (Bertek 33, Karakol) in the Gorny-Altaï region also looks Repin-influenced.

12. For Afanasievo, see Molodin 1997; and Kubarev 1988. On the craniometrics, see Hemphill and Mallory 2003; and Hemphill, Christensen, and Mustafakulov 1997. For the faunal remains from Balyktyul, see Alekhin and Gal'chenko 1995.

13. On the local cultures, see Weber, Link, and Katzenberg 2002; also Bobrov 1988.

14. Chernykh 1992:88; Chernykh, Kuz'minykh, and Orlovskaya 2004.

15. For Tocharian linkages to Afanasievo, see Mallory and Mair 2000.

16. See Gei 2000:176, for the count of all steppe vehicle graves, and for the wagons of the Novotitorovskaya culture. For the Yamnaya wagon grave at Balki kurgan, see Lyashko and Otroshchenko 1988. For the Yamnaya vehicle at Lukyanovka, see Mel'nik and Serdyukova 1988. For the Yamnaya vehicle graves north of the Danube delta, see Gudkova and Chernyakov 1981. The Yamnaya vehicle graves at Shumaevo cemetery II, kurgans 2 and 6, were the first wagon graves found in the Volga-Ural region in decades, excavated by M. A. Turetskii and N. L. Morgunova in 2001–2002. One wheel was recognized in kurgans 6 and three in kurgan 2; see Morgunova and Turetskii 2003. For early wheeled vehicles in general, see Bakker, et al. 1999.

17. Mel'nik and Serdyukova (1988:123) suggested that Yamnaya wagons had no practical use but were purely ritual imitations of vehicles used in the cults of Near Eastern kings. This ascribes to the Yamnaya people more veneration of distant Near Eastern symbols and less practical sense than seems likely to me. It also leaves unexplained the Yamnaya shift to an economy based on mobility. Even if some of the wagons placed in graves *were* lightly built funeral objects, that does not mean that sturdier originals did not exist.

18. Izbitser (1993) asserted that all these steppe vehicles, including those in graves where only two wheels were found, were four-wheeled wagons. Her opinion has been cited in arguments over the origin of the chariot to suggest that the steppe cultures perhaps had no experience making two-wheeled vehicles; see Littauer and Crouwel 1996:936. But many graves contain just two wheels, including Bal'ki kurgan, grave 57. The image on the Novosvobodnaya cauldron at Evdik looks like a cart. Ceramic cart models associated with the Catacomb culture (2800–2200 BCE) and in the North Caucasus at the Badaani site of the ETC or Kura-Araxes culture (3500–2500 BCE) are interpreted by Izbitser as portraying something other than vehicles. Gei, on the other hand, sees evidence for both carts and wagons, as do I. See Gei 2000:186.

19. The Dnieper region of Merpert 1974 was divided into no fewer than six microregions by Syvolap 2001.

20. Telegin, Pustalov, and Kovalyukh 2003.

21. See Sinitsyn 1959; Merpert 1974; and Mallory 1977. For reconsiderations of Merpert's scheme in the light of the discovery of the Khvalynsk culture, see Dremov and Yudin 1992; and Klepikov 1994. For a review of all the early Yamnaya variants in the Volga-Don-Caucasus region, and their chronology, see Vasiliev, Kuznetsov, and Turetskii 2000.

22. Whereas Mikhailovka I produced 1,166 animal bones, Mikhailovka II and III together yielded 52,540 bones.

23. For Yamnaya seed imprints, see Pashkevich 2003. Pashkevich identifies Mikhailovka II as a settlement of the Repin culture, reflecting the debate about its ceramic affiliation referred to in the text; see also Kotova and Spitsyna 2003.

24. For Yamnaya and Catacomb chronology, see Trifonov 2001; Gei 2000; and Telegin, Pustalov, and Kovalyukh 2003. For western Yamnaya and Catacomb dates, see Koško and Klochko 2003.

25. These views were well stated by Khazanov (1994) and Barfield (1989).

26. For grain cultivation by steppe nomads, see Vainshtein 1980; and DiCosmo 1994. For modern nomads who ate very little grain, see Shakhanova 1989. For the growth of bodyguards into armies, see DiCosmo 1999, 2002.

27. See Shilov 1985b.
28. For a study of seasonal indicators in kurgans in the Kalmyk steppes, see Shishlina 2000. For comments on the Yamnaya herding pattern in the Dnieper steppes, see Bunyatyan 2003.
29. For Samsonova, see Gei 1979. For Liventsovka, see Bratchenko 1969. The predominance of cattle at these places is mentioned in Shilov 1985b:30.
30. Surface scatters of Yamnaya lithics and ceramics in the Manych Depression in Kalmykia are mentioned by Shishlina and Bulatov 2000; and in the lower Volga and North Caspian steppes by Sinitsyn 1959:184. Desert or semi-desert conditions in these places make surface sites more visible than they are in the northern steppes, where the sod hides the ground. In the Samara oblast we found LBA occupations 20–30 cm beneath the modern ground surface; see Anthony et al. 2006. The winter camps of the Blackfeet are described in Ewers 1955:124–126: “Green Grass Bull said that bands whose members owned large horse herds had to move camp several times each winter. . . . However, a short journey of less than a day’s march might bring them to a new site possessing adequate resources for another winter camp . . . Demands on fuel and grass were too great to allow all the members of a tribe to winter in one large village.” This kind of behavior might make Yamnaya camps hard to find.
31. The Tsa-Tsa grave is described in Shilov 1985a.
32. Yamnaya dental pathologies in the middle Volga region with comparative data from Hsiung-Nu and other cemeteries were studied by Eileen Murphy at Queen’s University Belfast as part of the Samara Valley Project. The unpublished internal report is in Murphy and Khokhlov 2004; see also Anthony et al. 2006. For caries in different populations, see Lukacs 1989.
33. For phytoliths in Yamnaya graves, see Shishlina 2000. The yields of *Chenopodium* and einkorn wheat were compared by Smith 1989. *Amaranthus* has 22% more protein (g/kg) than bread wheat, and *Chenopodium* has 34% more; wheat is higher in carbohydrates than either. For nutrient comparisons, see Gremillion 2004.
34. For the high incidence of curbitra orbitalis among Yamnaya skeletons, see Murphy and Khokhlov 2004; and Anthony et al. 2006.
35. For lactose tolerance, see Enattah 2005.
36. See Vainshtein 1980:59, 72, for comments on cows, milk foods, and poverty.
37. Mallory 1990.
38. On genders in Yamnaya graves, see Murphy and Khokhlov 2004; Gei 1990; Häusler 1974; and Mallory 1990.
39. On “Amazon” graves, see Davis-Kimball 1997; and Guliaev 2003.
40. Alexander Gei (1990) estimated a population density of 8–12 people per 100 km<sup>2</sup> in the EBA Novotitorovskaya and 12–14 per 100 km<sup>2</sup> in the MBA Catacomb periods in the Kuban steppes. But kurgans were erected only for a small percentage of those who died, so Gei’s figures undercount the actual population density by an order of magnitude. At ten times his grave-based estimate, or about 120 people per 100 km<sup>2</sup>, the population density would have been like that of modern Mongolia, where pastoralism is the dominant element in the economy.
41. Golyeva 2000.
42. For the equation between the status and man-days invested in the funeral, see Binford 1971. See also Dovchenko and Rychkov 1988; Mallory’s analysis of their study in Mallory 1990; and Morgunova 1995.
43. The granulated decoration on the two golden rings from Utyevka I, kurgan 1, grave 1, is surprising, since the technique of making and applying golden granulation requires very specific skills that first appeared about 2500 BCE (Troy II, Early Dynastic III). The middle Volga was apparently connected with the Troad through some kind of network at this time. The axe in the Utyevka grave is an early type, similar to the axes of Novosvobodnaya and Yamnaya, and that implies a very early Poltavka date. The grave form and artifact assemblage taken together suggested to Vasiliev a date at the late Yamnaya–early Poltavka transition, so probably about 2800 BCE. The grave has not been dated by radiocarbon. For Utyevka I and its analogies, see

Vasiliev 1980. For the Kutuluk grave with the mace, see Kuznetsov 1991, 2005. For an overview, see Chernykh 1992:83–92.

44. Chernykh 1992:83–92.
45. For the Yamnaya grave at Pershin, see Chernykh; and Isto 2002. For the “clean” copper on the Volga, see Korenevskii 1980.
46. For the Post-Mariupol graves, see Ryndina 1998:170–179; for Lebedi, see Chernykh 1992:79–83; and for Voroshilovgrad, see Berezanskaya 1979.
47. For the iron blade, see Shramko and Mashkarov 1993.
48. Oared longboats are not actually portrayed in surviving art until Early Cycladic II, after 2900–2800 BCE, but the number of settled Cycladic Islands jumped from 10% to 90% for the first time in Early Cycladic I, beginning about 3300 BCE. This was possible only with a reliable form of seagoing transport. Longboats capable of holding twenty to forty oarsmen probably appeared earlier than ECII. See Broodbank 1989.
49. For Kemi-Oba graves in the Odessa oblast, see Subbotin 1995. For stone stelae in the North Pontic steppes generally, see Telegin and Mallory 1994.

## CHAPTER 14. THE WESTERN INDO-EUROPEAN LANGUAGES

1. For a good essay on the subject of language shift, see the introduction in Kulick 1992. For Scots Gaelic, see Dorian 1981; see also Gal 1978.

2. For the Galgenberg site of the Cham culture, see Ottaway 1999. Bökönyi saw the statistical source of the larger horses that appeared in Central Europe in the horse population at Dereivka; Benecke suggested that the horses of Late Mesolithic Mirnoe in the steppes north of the Danube delta were a closer match. But both agreed that the source of the new larger breeds was in the steppes. See Benecke 1994:73–74; and Bökönyi 1974.

3. For the Bukhara horse trade, see Levi 2002. I am indebted to Peter Golden and Ranabir Chakravarti for calling my attention to it.

4. Polomé 1991. For the translation of the *Rig Veda* passage, see O’Flaherty 1981:92.

5. See Kristiansen and Larsson 2005:238.

6. See Benveniste 1973:61–63 for feasts; also see the entry for GIVE in Mallory and Adams 1997:224–225; and Markey 1990. For poets, see Watkins 1995:73–84. For the general importance of feasting in tribal societies, see Dietler and Hayden 2001. For an ethnographic parallel where chiefs and poets were mutually dependent, see Lehman 1989.

7. Mallory (1998) referred to this process using the wry metaphor of the *Kultatkugel*, a bullet of language and culture that acquired a new cultural skin after penetrating a target culture, but retained its linguistic core.

8. A broad scatter of kurgan graves in the steppes contained imported Tripolye C2 pots (among other imported pot types) and a few, like Serezlievka, also contained Tripolye-like schematic rod-headed figurines. The Serezlievka-type graves in the South Bug valley probably were contemporary with Yamnaya graves of the Zhivotilovka-Volchansk group in the Dnieper-Azov steppes that also contained imported Tripolye C2 pots, dated by radiocarbon about 2900–2800 BCE. Rassamakin (1999, 2002) thought that Zhivotilovka-Volchansk graves represented a migration of Tripolye C2 people from the forested upper Dniester deep into the steppes east of the Dnieper. But a Tripolye pot in a Yamnaya grave is most simply interpreted as a souvenir, gift, or acquisition rather than as a migrant Tripolye person. Yamnaya graves rarely contained any pots. Cotsofeni pots filled that customary void in the Yamnaya graves of the Danube valley, just as pottery of the Tripolye C2, late Maikop, and Globular Amphorae types did in the Ukrainian steppes.

9. For the Usatovo culture see Zbenovich 1974; Dergachev 1980; Chernysh 1982; and Patovka et al. 1989. For a history of excavations at Usatovo, see Patovka 1976. The Cernavoda I affiliations of pre-Usatovo coastal steppe kurgans are discussed in Manzura, Savva and Boga-

toya 1995. A Cernavoda I feature in Usatovo is described in Boltenko 1957:42. Recent radiocarbon dates are discussed in Videiko 1999.

10. For Usatovo fauna see Zbenovich 1974: 111–115.
11. For spindle whorls, see Dergachev 1980:106.
12. See Kuz'minova 1990, for Usatovo paleobotany.
13. For Usatovo ceramics, see Zbenovich 1968, with a brief notice of the orange-slipped grey wares on page 54.
14. For trade between Usatovo, late Cernavoda III, and late Maikop, see Zbenovich 1974:103, 141. The single glass bead at Usatovo was colored white by the inclusion of phosphorus. It was in a grave pit covered by a stone lid, a stone cairn, and then by the kurgan. The pear-shaped bead measured 9 mm in diameter, had a hole 5 mm in diameter, and had slightly darker spiraling on its surface. Two cylindrical glass beads, colored with copper (green-blue) were recovered from the Tripolye C2 grave 125 at Sofievka on the Dnieper near Kiev, dated a century or two later, about 3000–2800 BCE (4320+70 BP, 4270+90 BP, 4300+45 BP, from three other graves at Sofievka). Two other glass beads were found on the surface near this grave but certainly were not from it. The glass in both Sofievka and Usatovo was made with ash as an alkali, not soda. An ash recipe was used in the Near East. For analyses, see Ostroverkhov 1985. For the radiocarbon dates from Sofievka and the amber beads from Zavalovka, see Videiko 1999.
15. For the daggers, see Anthony 1996. For oared longboats, see the end of the last chapter of this volume, and Broodbank 1989.
16. For the ochre-painted skulls, see Zin'kovskii and Petrenko 1987.
17. For Zimnea, see Bronicki, Kadrow, and Zakościelna 2003; see also Movsha 1985; and Koško 1999.
18. For fortifications, see Chernysh 1982:222.
19. See Boyadziev 1995, for the dating of the migration.
20. For the large cluster in Hungary, see Ecsedy 1979, 1994. For the cluster in Oltenia, see Dumitrescu 1980. For the cluster in northern Serbia, see Jovanovich 1975. For Bulgaria, see Panayotov 1989. For overviews see, Nikolova 2000, 1994. For relative chronologies at the time of the migration event in southeastern Europe generally, see Parzinger 1993. For the wagon grave at Plachidol, see Sherratt 1986. For the stone stelae, see Telegin and Mallory 1994. Ecsedy mentions that undecorated stone stelae were found near Yamnaya kurgans in Hungary.
21. The graves in Hungary could possibly have been the result of a separate migration stream that passed directly over the Carpathians through Late Tripolye territory rather than being a continuation of the lower Danube valley stream.
22. Most of the radiocarbon dates for Yamnaya graves in the Odessa oblast, the heart of the Dniester steppes, are quite late, beginning about 2800–2600 BCE, by which time the Usatovo culture was gone. There are a few earlier radiocarbon dates (Semenovskii, k.11, 14; Liman, k.2; Novoseltsy, k.19), but in both of the Semenovskii kurgans the primary grave for which the kurgan was raised was an Usatovo grave, and all the Yamnaya graves were secondary. The stratigraphy makes me wonder about the early radiocarbon dates. Yamnaya seems to have taken over the Odessa oblast steppes after the Usatovo culture. See Gudkova and Chernyakov 1981; and Subbotin 1985.
23. Kershaw 2000; see also entries on *koriōs* and warfare in Mallory and Adams 1997. The cattle raid, a related institution, is discussed in Walcot 1979.
24. For Yamnaya dog-tooth ornaments on the Ingul, see Bondar and Nechitailo 1980.
25. For the stelae of the steppes, see Telegin and Mallory 1994. For the symbolic importance of belts, see Kershaw 2000:202–203; and Falk 1986:22–23.
26. Kalchev 1996.
27. Nikolova 1996.
28. Alexandrov 1995.
29. Panayotov 1989:84–93.
30. Barth 1965:69.

31. Bell Beaker decorated cup styles, domestic pot types, and grave and dagger types from the middle Danube were adopted about 2600 BCE in Moravia and Southern Germany. This material network could have been the bridge through which pre-Celtic dialects spread into Germany. See Heyd, Husty, and Kreiner 2004, especially the final section by Volker Heyd.
32. See Hamp 1998; and Schmidt 1991, for connections between Italic and Celtic.
33. For the effects of wheeled vehicles, see Maran 2001.
34. See Szmyt 1999, esp. 178–188.
35. On the Slavic homeland, see Darden 2004.
36. Coleman (2000) argued that Greek speakers entered Greece during the Final Neolithic/Bronze Age transition, about 3200 BCE. If an Indo-European language spread into Greece this early I think it was more likely an Anatolian-type language. For a northern steppe origin for Greek, but in a later era more amenable to my scenario, see Lichardus and Vladar 1996; and Penner 1998. The same evidence is marshaled for another purpose in Makkay 2000, and in detail by Kristiansen and Larsson 2005. Another argument for a northern connection of the Shaft Grave princes is presented in Davis 1983. Connections between southeastern Europe and Greece are outlined in Hänsel 1982. Robert Drews (1988) also argued that the Shaft Grave princes were an immigrant dynasty from the north, although he derived them from Anatolia.
37. Mallory 1998:180.

## CHAPTER 15. CHARIOT WARRIORS OF THE NORTHERN STEPPE

1. See Gening, Zdanovich, and Gening 1992, for the original report on Sintashta.
2. The Sintashta culture remained unrecognized as recently as 1992. Chernykh (1992:210–234) discussed Sintashta-type metals as part of the “Andronovo historico-cultural community,” assigning it to about 1600–1500 BCE. Dorcas Brown and I visited Nikolai Vinogradov in 1992, and I was permitted to take bone samples from the chariot grave at Krivoе Ozero for radiocarbon dating. This resulted in two articles: Anthony 1995a; and Anthony and Vinogradov 1995. See Vinogradov 2003, for the complete report on the Krivoе Ozero cemetery. For the settlement and cemeteries at Arkaim, see Zdanovich 1995; and Kovaleva and Zdanovich 2002. For the Sintashta cemetery at Kammeny Ambar, see Epimakhov 2002. For a wide-ranging overview, see Grigoriev 2002, marred by the assumption that the Sintashta culture and many other steppe cultures originated from a series of south-to-north folk migrations from Anatolia and Syria, where he argued that the Indo-European homeland was located. See Lamberg-Karlovsky 2002, for connections to Central Asia. For conference proceedings, see Jones-Bley and Zdanovich 2002; Boyle, Renfrew, and Levine 2002; and Levine, Renfrew, and Boyle 2003.
3. I use the term *Aryan* here as it is defined it in chapter 1, as the self-designation of the people who composed the hymns and poems of the *Rig Veda* and *Avesta* and their immediate Indo-Iranian ancestors.
4. For the contact zone between Corded Ware, Globular Amphorae, and Yamnaya at about 2800–2600 BCE, see Szmyt 1999, esp. pp. 178–188. Also see Machnik 1999; and Klochko, Koško, and Szmyt 2003. A classic review of the archaeological evidence for mixed Yamnaya, late Tripolye (Chapaevka), and Corded Ware elements in Middle Dnieper origins is Bondar 1974. A recent review emphasizes the Yamnaya influence on the Middle Dnieper culture, in Telegin 2005.
5. For Middle Dnieper chronology, see Kryvaltsevich and Kovalyukh 1999; and Yazepenka and Koško 2003.
6. Machnik 1999.
7. Before the Middle Dnieper culture appeared, the east side of the river near Kiev had been occupied between about 3000 and 2800 BCE by the mixed-origin late Tripolye C2 Sofievka group, which cremated its dead, used riveted daggers like those at Usatovo, and made

pottery that showed both cord-impressed steppe elements and late Tripolye elements. For the Sofievka settlement, see Kruts 1977:109–138; for radiocarbon dates, see Videiko 1999.

8. See Carpelan and Parpola 2001. This almost monograph-length article covers much of the subject matter discussed in this chapter. For Corded Ware migrations from the genetic point of view, see Kasperavičiūtė, Kučinskas, and Stoneking 2004.

9. For Balanovo, Abashevo, and Volosovo, see Bol'shov 1995. For Abashevo ceramics, see Kuzmina 1999. The classic work on Abashevo is Pryakhin 1976, updated in Pryakhin 1980. For an English account, in addition to Carpelan and Parpola 2001, see Chernykh 1992:200–204 and Koryakova and Epimakhov 2007.

10. For the Volosovo culture, see Korolev 1999; Vybornov and Tretyakov 1991; and Bakharev and Obchinnikova 1991.

11. For Abashevo and Indo-Iranian linkages, see Carpelan and Parpola 2001; and Pryakhin 1980.

12. For the headbands, see Bol'shov 1995.

13. See Keeley 1996, on tribal war.

14. See Koivulehto 2001; and Carpelan and Parpola 2001.

15. See Ivanova 1995:175–176, for the Aleksandrovskaya IV kurgan cemetery.

16. For Kuisak settlement, see Maliutina and Zdanovich 1995.

17. In Table 1, sample AA 47803, dated ca. 2900–2600 BCE, was from a human skeleton of the Poltavka period that was later cut through and decapitated by a much deeper Potapovka grave pit. A horse sacrifice above the Potapovka grave is dated by sample AA 47802 to about 1900–1800 BCE. Although they were almost a thousand years apart, they looked, on excavation, like they were deposited together, with the Potapovka horse skull lying above the shoulders of the decapitated Poltavka human. Before dates were obtained on both the horse and the skeleton this deposit was interpreted as a “centaur”—a decapitated human with his head replaced by the head of a horse, an important combination in Indo-Iranian mythology. But Nerissa Russell and Eileen Murphy found that both the horse and the human were female, and the dates show that they were buried a thousand years apart. Similarly sample AA-12569 was from an older Poltavka-period dog sacrifice found on the ancient ground surface at the edge of Potapovka grave 6 under kurgan 5 at the same cemetery. Older Poltavka sacrifices and graves were discovered under both kurgans 3 and 5 at Potapovka cemetery I. The Poltavka funeral deposits were so disturbed by the Potapovka grave diggers that they remained unrecognized until the radiocarbon dates made us take a second look. The “centaur” possibility was mentioned in Anthony and Vinogradov 1995, five or six years before the two pieces were dated. Of course, it now must be abandoned.

18. For Sarazm, see Isakov 1994.

19. For Kelteminar, see Dolukhanov 1986; and Kohl, Francfort, and Gardin 1984. The classic work on Kelteminar is Vinogradov 1981.

20. For a radiocarbon date from Sergeivka, see Levine and Kislenko 2002, but note that their discussion mistakenly assigns it to the Andronovo period, 1900–1700 BCE. See also Kislenko and Tatarintseva 1990. Another transitional forager-herder group influenced by Poltavka was the Vishnevka 1 pottery group in the forest-steppe on the northern Ishim; see Tatarintseva 1984. For Sergeivka sherds at the Poltavka cemetery of Aleksandrovka, see Maliutina and Zdanovich 1995:105.

21. For climate deterioration, see Blyakharchuk et al. 2004; and Kremenetski 2002, 1997a, 1997b.

22. Rosenberg 1998.

23. For the Mesopotamian metal trade, see Muhly 1995; Potts 1999:168–171, 186.

24. For metals and mining, see Grigoriev 2002:84; and Zaikov, Zdanovich, and Yuminov 1995. See also Kovaleva and Zdanovich 2002. Grigoriev suggested that the amount of slag found in each house was so small that it could represent household production. However, slag is often found in small amounts even at industrial sites, and that all houses contained slag and

production facilities (ovens with attached wells that aided in the updraft) shows an intensity of metal production that was unprecedented in the steppes.

25. See DiCosmo 1999, 2002; and Vehik 2002.
26. Ust'e, like Chernorech'e III, was excavated by Nikolai Vinogradov. Vinogradov was kind enough to show me his plans and photographs from Ust'e, where Sintashta houses are clearly stratified beneath a Petrovka occupation.
27. See Epimakhov 2002:124–132 for the artifact catalogue.
28. For the ballistics of flint projectile points, see Knecht 1997; and Van Buren 1974. For javelins in Greek chariot warfare, see Littauer 1972; and Littauer and Crouwel 1983.
29. For the chariot petroglyphs, see Littauer 1977; Samashev 1993; and Jacobsen-Tepfer 1993. On the derivation of steppe cheekpieces from Mycenaean cheekpieces, see E. Kuzmina 1980. For a review of European cheekpieces, see Hüttel 1992. Littauer and Crouwel (1979) argued persuasively for the Near Eastern origin of the chariot, overthrowing pre-World War II suggestions that the chariot was a super-weapon of the steppe Aryans. Piggott (1983, 1992) began to challenge the Near Eastern origin hypothesis almost immediately. Moorey (1986) also supported a multiregional invention of the various elements combined in the chariot.
30. See Epimakhov 2002:124–132 for a grave inventory that totals sixteen chariot graves; see Kuzmina 2001:12 for an estimate of twenty. The sites Kuzmina lists include Sintashta (seven chariot graves), Kamenny Ambar (two), Solntse II (three), Krivo Ozero (three), and, in northern Kazakhstan, in Petrovka graves, Ulybai (one), Kenes (one), Berlyk II (two), and Satan (one).
31. For arguments against the functionality of steppe chariots, see Littauer and Crouwel 1996; Jones-Bley 2000; and Vinogradov 2003:264, 274. For arguments in favor of the steppe chariots as effective instruments of war, see Anthony and Vinogradov 1995; and Nefedkin 2001.
32. For English descriptions of the narrow-gauge chariots, see Gening 1979; Anthony and Vinogradov 1995; and Anthony 1995a. For two critical replies, see Littauer and Crouwel 1996; and Jones-Bley 2000. For the limitations of the chariot in battle, see Littauer 1972; and Littauer and Crouwel 1983.
33. For Bronze Age steppe bows, see Grigoriev 2002:59–60; Shishlina 1990; Malov 2002; and Bratchenko 2003:199. For ancient bows of the Near East and Iran, see Zutterman 2003.
34. See Littauer 1968.
35. For the disk cheekpieces, see Priakhin and Besedin 1999; Usachuk 2002; and Kuzmina 2003, 1980. For left and right side differences, see Priakhin and Besedin 1999:43–44. For chariots in the *Rig Veda*, see Sparreboom 1985. For the metal examples in the Levant, see Littauer and Crouwel 1986, 2001. This type of cheekpiece probably spread into Mycenaean Greece from southeastern Europe, where it appeared in Otomani, Monteoru, and Vatin contexts. For radio-carbon dates for these cultures, see Forenbaher 1993, and for disk-shaped cheekpieces in those contexts, see Boroffka 1998, and Hüttel 1994. The European origin of Mycenaean charioteery might explain why Mycenaean chariot warriors, like the early charioteers of the northern steppes, sometimes carried spears or javelins. For chariots in Greece, see Crouwel 1981.
36. For a review of the Near Eastern evidence for chariots, see Oates 2003; for older studies, see Moorey 1986, and Littauer and Crouwel 1979. For vehicles at Tell Brak, see Oates 2001:141–154. If we were to accept the “low” chronology, which seems increasingly likely, the date for the end of Ur III and the earliest proto-chariots would shift down from 2000 to 1900 BCE. See Reade 2001.
37. See Stillman and Tallis 1984:25 for Mitanni chariot squadrons; for Chinese chariot squadrons, see Sawyer 1993:5.
38. See Appuradai 1986:21 for the “tournament of values.”
39. For human pathologies, see Lindstrom 2002, who notes the complete absence of dental caries, even in the oldest individuals (161). Lindstrom was the first Western archaeologist to participate in excavations at a Sintashta site.

40. Igor Ivanov, a geomorphologist at Arkaim, told me in 2000 that the reports of irrigation channels at Arkaim were mistaken, that these were natural features.
41. See Gening, Zdanovich, and Gening 1992:234–235 for Sacrificial Complex 1, and page 370 for the man-days for the SB kurgan.
42. For feasting in tribal societies, see Hayden 2001.
43. For the fauna, see Kosintsev 2001; and Gaiduchenko 1995. For <sup>N</sup>15 isotopes in human and animal bones, see Privat 2002.
44. For doubts about social hierarchy in Sintashta society, see Epimakhov 2000:57–60.
45. Witzel 1995:109, citing Kuiper 1991.
46. For various theories on how to link Sintashta and the Indo-Iranians, see Parpola 1988, 2004–2005; E. Kuzmina 1994, 2001; and Witzel 2003.
47. All quotations are from O’Flaherty 1981.
48. For the Indo-European dog sacrifice and New Year initiation ceremony, see Kershaw 2000; and Kuiper 1991, 1960.
49. Epimakhov 2002; and Anthony et al. 2005.

## CHAPTER 16. THE OPENING OF THE EURASIAN STEPPESS

1. For exotic knowledge and power, see Helms 1992.
2. For Indic terms among the Mitanni, see chapter 3; Thieme 1960; and Burrow 1973.
3. Elamite was a non-Indo-European language of uncertain affiliations. As Dan Potts stressed, the people of the western Iranian highlands never used this or any other common term as a blanket ethnic designation for themselves. They did not even all speak Elamite. See Potts 1999:2–4. For the appearance of horses, see Oates 2003.
4. See Weiss 2000; also Perry and Hsu 2000.
5. At Godin Tepe, onagers were 94% of the equid bones. A cheektooth and a metacarpal from Godin IV, dated about 3000–2800 BCE, might be horse. The first clear and unambiguous horse bones at Godin appeared in period III, dated 2100–1900 BCE; see Gilbert 1991. On horses and mules at Malyan, see Zeder 1986. The bit wear at Malyan is the earliest unambiguous bit wear in the Near East. Copper stains reported on the P<sub>2</sub>s of asses from Tell Brak, dated 2300–2000 BCE, might have had another cause (perhaps corroded lip rings). See Clutton-Brock 2003.
6. Owen 1991.
7. The phrase *Fahren und Reiten*, or “To drive and to ride,” appeared between 1939 and 1968 in the titles of three influential publications by Joseph Weisner, and the order of terms in this phrase—driving *before* riding—has become a form of shorthand referring to the historical priority of the chariot over the ridden horse in the Bronze Age civilizations of the Near East. Certainly wheeled vehicles preceded horseback riding in the Near East, and horse-drawn chariots dominated Near Eastern warfare long before cavalry, but this was not because riding was invented after chariotry (see chapter 10). If images of horseback riding can now be dated before 1800 BCE, as seems to be the case, they preceded the appearance of horses with chariots in Near Eastern art. See Weisner 1939, 1968; Drews 2004:33–41, 52; and Oates 2003.
8. For Zimri-Lim’s adviser’s advice, see Owen 1991; n. 12.
9. For tin sources, see Muhly 1995:1501–1519; Yener 1995; and Potts 1999:168–171, 186. For Eneolithic Serbian tin-copper alloys, see Glumac and Todd 1991. For the possible mistranslation of the Gudea inscription I am indebted to Chris Thornton, and, through him, to Greg Possehl and Steven Tinney. For the seaborne tin trade in the Arabian Gulf, see Weeks 1999; and for the Bactrian comb at Umm-al-Nar, see Potts 2000:126. For Harappan metals, see Agrawal 1984.
10. The polymetallic ores of the Zeravshan probably produced the metals of Ilgynly-Depe, near Anau, during the fourth millennium BCE. At Ilgynly, among sixty-two copper artifacts, primarily tanged knives, one object contained traces of tin; see Solovyova et al. 1994. For tin

bronzes in early third-millennium Namazga IV, see Salvatori et al. 2002. For Sarazm, see Isakov 1994; for its radiocarbon dates and metals, see Isakov, et al. 1987.

11. For the tin mines of the Zeravshan, see Boroffka et al. 2002; and Parzinger and Boroffka 2003.

12. Zaman Baba graves have been seen as a hybrid between Kelteminar and Namazga V/VI-type cultures, see Vinogradov 1960:80–81; and as a hybrid with Catacomb cultures on the supposition that Catacomb-culture people migrated to Central Asia, see Klejn 1984. I support the former. For recent debates over Zaman Baba, see E. Kuzmina 2003:215–216.

13. Lyonnet (1996) sees Sarazm IV ending during Namazga IV, or during the middle of the third millennium BCE. I see Sarazm ending in late Namazga V/early VI, based on the co-occurrence of Petrovka and late Sarazm pottery at Tugai, and on radiocarbon dates indicating that Sarazm III was occupied in 2400–2000 BCE, so Sarazm IV had to be later.

14. For skull type affiliations, see Christensen, Hemphill, and Mustafakulov 1996.

15. For BMAC, see Hiebert 1994, 2002. Salvatori (2000) disagreed with Hiebert, suggesting that BMAC began much earlier than 2100 BCE, and grew from local roots, not from an intrusion from the south, making the growth of BMAC more gradual. For the BMAC graves at Mehrgarh VIII, see Jarrige 1994. For BMAC materials in the Arabian Gulf, see Potts 2000, During Caspers 1998; and Winckelmann 2000.

16. For tin-bronzes in Bactria and lead-copper alloys in Margiana, see Chernykh 1992:176–182; and Salvatori et al. 2002. For the lead ingot at Sarazm, see Isakov 1994:8. For the Iranian background, see Thornton and Lamberg-Karlovsky 2004.

17. For horse bones in BMAC, see Salvatori 2003; and Sarianidi 2002. For the BMAC seal with the rider, see Sarianidi 1986. A few horses might have passed through the Caucasus into western Iran before 3000 BCE, indicated by a few probable horse teeth at the site of Qabrestan, west of Teheran; see Mashkour 2003. No definite horse remains have been identified in eastern Iran or the Indian subcontinent dated earlier than 2000 BCE. See Meadow and Patel 1997.

18. For the steppe sherds in BMAC sites, see Hiebert 2002. For the “Abashevo-like” sherds at Karnab, see Parzinger and Boroffka 2003:72, and Figure 49.

19. For Tugai, see Hiebert 2002; E. Kuzmina 2003; and the original report, Avanessova 1996. The talc temper in two pots, an indication that they were made in the South Ural steppes, is described in Avanessova 1996:122.

20. For Zardcha Khalifa, see Bobomulloev 1997; and E. Kuzmina 2001, 2003:224–225.

21. For the lead wires at Kuisak, see Maliutina and Zdanovich 1995:103. For the lapis bead and the grave at Krasnoe Znamya, see E. Kuzmina 2001:20.

22. For Srubnaya subsistence, see Bunyatyan 2003; and Ostroshchenko 2003.

23. For *Chenopodium* yields, see Smith 1989:1569.

24. For the Samara Valley Project, see Anthony et al. 2006. The results obtained here were replicated at Kibit, another Srubnaya settlement in Samara Oblast, excavated by L. Popova and D. Peterson, where there was no cultivated grain and many seeds of *Chenopodium*.

25. For the enormous Srubnaya mining center at Kargaly, see Chernykh 1997, 2004. For the mining center in Kazakhstan near Atasu, see Kadyrbaev and Kurmankulov 1992.

26. For stratigraphic relationships between Sintashta and Petrovka, see Vinogradov 2003; and Kuzmina 2001:9. The Petrovka culture was a transitional culture marking the beginning of the LBA. For Petrovka and its stratigraphic relationships to Alakul and Federovo, see Maliutina 1991. I would like to acknowledge the difficulty of keeping all these P-k cultures straight: on the middle Volga the MBA Poltavka culture evolved into final MBA Potapovka and then into early LBA Pokrovka, which was contemporary with early LBA Petrovka in Kazakhstan.

27. For the north-south movements of nomads in Kazakhstan, see Gorbunova 1993/94.

28. See Grigoriev 2002:78–84, for Petrovka metals.

29. For the Rostovka cemetery, see Matiushchenko and Sinitsyna 1988. For general discussions in English, see Chernykh 1992:215–234; and Grigoriev 2002:192–205.

30. For Seima-Turbino hollow-cast bronze casting and its influence on early China through the Qijia culture of Gansu province, see Mei 2003a, 2003b; and Li 2002. See also Fitzgerald-Huber 1995 and Linduff, Han, and Sun 2000.
31. See Epimakhov, Hanks, and Renfrew 2005 for dates. Seima-Turbino might possibly have begun west of the Urals and spread eastward. Sintashta fortifications might then be seen as a reaction to the emergence of Seima-Turbino warrior bands in the forest zone, but this is a minority position; see Kuznetsov 2001.
32. For Alakul and Federovo elements on the same pot, see Maliutina 1984; for the stratigraphic relations between the two, see Maliutina 1991. For radiocarbon dates, see Parzinger and Boroffka 2003:228.
33. E. Kuzmina 1994:207–208.
34. For Andronovo mines near Karaganda, see Kadyrbaev and Kurmankulov 1992; for mines near Dzhezkazgan, see Zhaiymbaev 1984. For the estimate of copper production, see Chernykh 1992:212.
35. For the Namazga VI pottery at Pavlovka, see Maliutina 1991:151–159.
36. For Andronovo sites in the Zeravshan, see Boroffka et al. 2002. For Tazabagyab sites on the former Amu-Darya delta, see Tolstov and Kes' 1960:89–132.
37. Hiebert 2002.
38. For the post-BMAC pastoral groups who made coarse incised ware, see Salvatori 2003:13; also Salvatori 2002. For the Vaksh and Bishkent groups, see Litvinsky and P'yankova 1992.
39. See Witzel 1995.
40. Books 2 and 4 of the *Rig Veda* referred to places in eastern Iran and Afghanistan. Book 6 described two clans who claimed they had come from far away, crossed many rivers, and gone through narrow passages, fighting indigenous people referred to as *Dasyus*. These details suggest that the Aryans fought their way into the Indian subcontinent from eastern Iran and Afghanistan. Although some new elements such as horses can be seen moving from Central Asia into the Indian subcontinent at this time, and intrusive pottery styles can be identified here or there, no single material culture spread with the Old Indic languages. For discussions, see Parpola 2002; Mallory 1998; and Witzel 1995:315–319.
41. For *Indra* and *Soma* as loan words, see Lubotsky 2001. Indra combined attributes that originally were separate: the mace was Mithra's; some of his epithets, his martial power, and perhaps his ability to change form were Verethraghna's; and the slaying of the serpent was the feat of the hero Thrataona, the Third One. The Old Indic poets gave these Indo-Iranian traits to Indra. The most prominent aspect of Indo-Iranian Verethraghna, the god of might/victory, was his shape-shifting ability, especially his form as the Boar. See Malandra 1983:80–81.
42. V. Sarianidi proposed that the people of the BMAC spoke Iranian. Sarianidi suggested that “white rooms” inside the walled buildings at Togolok 21, Togolok 1, and Gonur were fire temples like those of the Zoroastrians, with vessels containing *Ephedra*, *Cannabis*, and poppy seeds, which he equated with *Soma* (RV) or *Haoma* (AV). But examinations of the seed and stem impressions from the “white rooms” at Gonur and Togolok 21 by paleobotanists at Helsinki and Leiden Universities proved that the vessels contained no *Cannabis* or *Ephedra*. Instead the impressions probably were made by millet seeds and stems (*Panicum miliaceum*); see Bakels 2003. The BMAC culture makes a poor match with Indo-Iranian. The BMAC people lived in brick-built fortified walled towns, depended on irrigation agriculture, worshiped a female deity who was prominent in their iconography (a goddess with a flounced skirt), had few horses, no chariots, did not build kurgan cemeteries, and did not place carefully cut horse limbs in their graves.
43. Li 2002; and Mei 2003a.

## CHAPTER 17. WORDS AND DEEDS

1. See Diamond 1997.
2. Hobsbawm 1997:5–6: “For history is the raw material for nationalist or ethnic or fundamentalist ideologies, as poppies are the raw material for heroin addiction. . . . This state of affairs affects us in two ways. We have a responsibility for historical facts in general and for criticizing the politico-ideological abuse of history in particular.”
3. O’Flaherty 1981:69.

## REFERENCES



- Agapov, S. A., I. B. Vasiliev, and V. I. Pestrikova. 1990. *Khvalynskii Eneoliticheskii Mogil'nik*. Saratov: Saratovskogo universiteta.
- Agrawal, D. P. 1984. Metal technology of the Harappans. In *Frontiers of the Indus Civilization*, ed. B. B. Lal and S. P. Gupta, pp. 163–167. New Delhi: Books and Books, Indian Archaeological Society.
- Akhinzhalov, S. M., L. A. Makarova, and T. N. Nurumov. 1992. *K Istorii Skotovodstva i Okhoty v Kazakhstane*. Alma-Ata: Akademiya nauk Kazakhskoi SSR.
- Alekhin, U. P., and A. V. Gal'chenko. 1995. K voprosu o drevneishem skotovodstve Altaya. In *Rossiya i Vostok: Problemy Vzaimodeistviya*, pt. 5, bk. 1: *Kul'tury Eneolita-Bronzy Stepnoi Evrazii*, pp. 22–26. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- Alekseeva, I. L. 1976. O drevneishikh Eneoliticheskikh pogrebeniyakh severo-zapadnogo prichernomor'ya. In *Materialy po arkheologii severnogo prichernomor'ya* (Kiev) 8:176–186.
- Alexandrov, Stefan. 1995. The early Bronze Age in western Bulgaria: Periodization and cultural definition. In *Prehistoric Bulgaria*, ed. Douglass W. Bailey and Ivan Panayotov, pp. 253–270. Monographs in World Archaeology 22. Madison, Wis.: Prehistory Press.
- Algaze, G. 1989. The Uruk Expansion: Cross-cultural exchange in Early Mesopotamian civilization. *Current Anthropology* 30:571–608.
- Alvarez, Robert R., Jr. 1987. *Familia: Migration and Adaptation in Baja and Alta California, 1800–1975*. Berkeley: University of California Press.
- Amiet, Pierre. 1986. *L'Âge des Échanges Inter-Iraniens 3500–1700 Avant J-C*. Paris: Editions de la Réunion des Musées Nationaux.
- Andersen, Henning. 2003. Slavic and the Indo-European migrations. In *Language Contacts in Prehistory: Studies in Stratigraphy*, ed. Henning Andersen, pp. 45–76. Amsterdam and Philadelphia: Benjamins.
- Antilla, R. 1972. *An Introduction to Historical and Comparative Linguistics*. New York: Macmillan.
- Anthony, David W. 2001. Persistent identity and Indo-European archaeology in the western steppes. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpola, and Petteri Koskikallio, pp. 11–35. Memoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- . 1997. “Prehistoric migration as social process.” In *Migrations and Invasions in Archaeological Explanation*, ed. John Chapman and Helena Hamerow, pp. 21–32. British Archaeological Reports International Series 664. Oxford: Archeopress.
- . 1996. V. G. Childe's world system and the daggers of the Early Bronze Age. In *Craft Specialization and Social Evolution: In Memory of V. Gordon Childe*, ed. Bernard Wailes, pp. 47–66. Philadelphia: University of Pennsylvania Museum Press.
- . 1995a. Horse, wagon, and chariot: Indo-European languages and archaeology. *Antiquity* 69 (264): 554–565.
- . 1995b. Nazi and Ecofeminist prehistories: ideology and empiricism in Indo-European archaeology. In *Nationalism, Politics, and the Practice of Archaeology*, ed. Philip Kohl and Clare Fawcett, pp. 82–96. Cambridge: Cambridge University Press.
- . 1994. On subsistence change at the Mesolithic-Neolithic transition in Ukraine. *Current Anthropology* 35 (1): 49–52.
- . 1991a. The archaeology of Indo-European origins. *Journal of Indo-European Studies* 19 (3–4): 193–222.

- . 1991b. The domestication of the horse. In *Equids in the Ancient World*, vol. 2, ed. Richard H. Meadow and Hans-Peter Uerpmann, pp. 250–277. Weisbaden: Verlag.
- . 1990. Migration in archaeology: The baby and the bathwater. *American Anthropologist* 92 (4): 23–42.
- . 1986. The “Kurgan Culture,” Indo-European origins, and the domestication of the horse: A reconsideration. *Current Anthropology* 27:291–313.
- Anthony, David W., and Dorcas Brown. 2003. Eneolithic horse rituals and riding in the steppes: New evidence. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 55–68. Cambridge: McDonald Institute for Archaeological Research.
- . 2000. Eneolithic horse exploitation in the Eurasian steppes: Diet, ritual, and riding. *Antiquity* 74:75–86.
- . 1991. The origins of horseback riding. *Antiquity* 65:22–38.
- Anthony, David W., D. Brown, E. Brown, A. Goodman, A. Kokhlov, P. Kosintsev, P. Kuznetsov, O. Mochalov, E. Murphy, D. Peterson, A. Pike-Tay, L. Popova, A. Rosen, N. Russel, and A. Weisskopf. 2005. The Samara Valley Project: Late Bronze Age economy and ritual in the Russian steppes. *Eurasia Antiqua* 11:395–417.
- Anthony, David W., Dorcas R. Brown, and Christian George. 2006. Early horseback riding and warfare: The importance of the magpie around the neck. In *Horses and Humans: The Evolution of the Equine-Human Relationship*, ed. Sandra Olsen, Susan Grant, Alice Choyke, and László Bartosiewicz, pp. 137–156. British Archaeological Reports International Series 1560. Oxford: Archeopress.
- Anthony, David W., Dimitri Telegin, and Dorcas Brown. 1991. The origin of horseback riding. *Scientific American* 265:94–100.
- Anthony, David W., and Nikolai Vinogradov. 1995. The birth of the chariot. *Archaeology* 48 (2): 36–41.
- Anthony, David W., and B. Wailes. 1988. CA review of *Archaeology and Language* by Colin Renfrew. *Current Anthropology* 29 (3): 441–445.
- Appadurai, Arjun. 1986. Introduction: Commodities and the politics of value. In *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai, pp. 3–63. Cambridge: Cambridge University Press.
- Armstrong, J. A. 1982. *Nations before Nationalism*. Chapel Hill: University of North Carolina Press.
- Arnold, Bettina. 1990. The past as propaganda: Totalitarian archaeology in Nazi Germany. *Antiquity* 64:464–478.
- Aruz, Joan. 1998. Images of the supernatural world: Bactria-Margiana seals and relations with the Near East and the Indus. *Ancient Civilizations from Scythia to Siberia* 5 (1): 12–30.
- Atkinson, R. R. 1994. *The Roots of Ethnicity: The Origins of the Acholi of Uganda before 1800*. Philadelphia: University of Pennsylvania Press.
- . 1989. The evolution of ethnicity among the Acholi of Uganda: The precolonial phase. *Ethnohistory* 36 (1): 19–43.
- Avanessova, N. A. 1996. Pasteurs et agriculteurs de la vallée du Zeravshan (Ouzbekistan) au début de l’âge du Bronze: relations et influences mutuelles. In B. Lyonnet, *Sarazm (Tadjikistan) Céramiques (Chalcolithique et Bronze Ancien)*, pp. 117–131. Paris: Mémoires de la Mission Archéologique Française en Asie Centrale Tome 7.
- Azzaroli, Augusto. 1980. Venetic horses from Iron Age burials at Padova. *Rivista di Scienze Preistoriche* 35 (1–2): 282–308.
- Bahn, Paul G. 1980. “Crib-biting: Tethered horses in the Palaeolithic?” *World Archaeology* 12:212–217.
- Bailey, Douglass W. 2000. *Balkan Prehistory: Exclusion, Incorporation, and Identity*. London: Routledge.

- Bailey, Douglass W., R. Andreescu, A. J. Howard, M. G. Macklin, and S. Mills. 2002. Alluvial landscapes in the temperate Balkan Neolithic: Transitions to tells. *Antiquity* 76:349–355.
- Bailey, Douglass W., and Ivan Panayotov, eds. 1995. Monographs in World Archaeology 22. *Prehistoric Bulgaria*. Madison, Wis.: Prehistory Press.
- Bailey, Douglass W., Ruth Tringham, Jason Bass, Mirjana Stefanović, Mike Hamilton, Heike Neumann, Ilke Angelova, and Ana Raduncheva. 1998. Expanding the dimensions of early agricultural tells: The Podgoritsa archaeological project, Bulgaria. *Journal of Field Archaeology* 25:373–396.
- Bakels, C. C. 2003. The contents of ceramic vessels in the Bactria-Margiana Archaeological Complex, Turkmenistan. *Electronic Journal of Vedic Studies* 9 (1).
- Bakharev, S. S., and N. V. Obchinnikova. 1991. Chesnokovskaya stoiankana na reke Sok. In *Drevnosti Vostochno-Europeiskoi Lesotepi*, ed. V. V. Nikitin, pp. 72–93. Samara: Samarskii gosudartsvennyi pedagogicheskii institut.
- Bakker, Jan Albert, Janusz Kruk, A. L. Lanting, and Sarunas Milisauskas. 1999. The earliest evidence of wheeled vehicles in Europe and the Near East. *Antiquity* 73:778–790.
- Baldi, Philip. 1983. *An Introduction to the Indo-European Languages*. Carbondale: Southern Illinois University Press.
- Balter, Michael. 2003. Early date for the birth of Indo-European languages. *Science* 302 (5650): 1490–1491.
- Bánffy, Ester. 1995. South-west Transdanubia as a mediating area: on the cultural history of the early and middle Chalcolithic. In *Archaeology and Settlement History in the Hahót Basin, South-West Hungary*, ed. Béla Miklós Szőke. Antaeus 22. Budapest: Archaeological Institute of the Hungarian Academy of Sciences.
- Bar-Yosef, Ofer. 2002. The Natufian Culture and the Early Neolithic: Social and Economic Trends in Southwestern Asia. In *Examining the Farming/Language Dispersal Hypothesis*, ed. Peter Bellwood and Colin Renfrew, pp. 113–126. Cambridge: McDonald Institute for Archaeological Research.
- Barber, Elizabeth J. W. 2001. The clues in the clothes: Some independent evidence for the movement of families. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 1–14. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- . 1991. *Prehistoric Textiles*. Princeton, N. J.: Princeton University Press.
- Barfield, Thomas. 1989. *The Perilous Frontier*. Cambridge: Blackwell.
- Barth, Frederik. 1972 [1964]. “Ethnic processes on the Pathan-Baluch boundary.” In *Directions in Sociolinguistics: The Ethnography of Communication*, ed. John J. Gumperz and Dell Hymes, pp. 454–464. New York: Holt Rinehart.
- . 1965 [1959]. *Political Leadership among Swat Pathans*. Rev. ed. London: Athalone.
- Barth, Fredrik. 1969. *Ethnic Groups and Boundaries: The Social Organization of Culture Difference*. Repr. ed. Prospect Heights: Waveland.
- Bartlett, Robert. 1993. *The Making of Europe: Conquest, Colonization, and Cultural Change, 950–1350*. Princeton, N. J.: Princeton University Press.
- Barynin, P. P., and E. V. Kozin. 1998. Prirodno-kilmaticheskie i kul’turno-demograficheskie protsessy v severnom priKaspii v rannem i sredнем Golotsene. In *Arkhеologicheskie Kul’tury Severnogo Prikaspiya*, ed. R. S. Bagautdinov, pp. 66–83. Kuibyshev: Kuibyshevskii gosudartsvennyi pedagogicheskii institut.
- Barynin, P. P., and I. B. Vasiliev. 1988. Stoianka Khvalynskoi eneoliticheskoi kulturi Kara-Khuduk v severnom Prikaspii. In *Arkhеologicheskie Kul’tury Severnogo Prikaspiya*, ed. R. S. Bagautdinov, pp. 123–142, Kuibyshev: Kuibyshevskii gosudartsvennyi pedagogicheskii institut.
- Barynin, P. P., I. B. Vasiliev, and A. A. Vybornov. 1998. Stoianka Kyzyl-Khak II: pamiatnik epokhi rannei Bronzy severnogo prikaspiya. In *Problemy Drevnej Istorii Severnogo Prikaspiya*,

- ed. V. S. Gorbunov, pp. 179–192, Samara: Samarskogo gosudarstvennogo pedagogicheskogo universiteta.
- Bashkow, Ira. 2004. A neo-Boasian conception of cultural boundaries. *American Anthropologist* 106 (3): 443–458.
- Beekes, Robert S. P. 1995. *Comparative Indo-European Linguistics: An Introduction*. Amsterdam: John Benjamins.
- Beilekchi, V. S. 1985. Raskopki kurgana 3 u s. Kopchak. *Arkheologicheskie Issledovaniya v Mol-davii v 1985 g.*, pp. 34–49. Kishinev: Shtiintsa.
- Belanovskaya, T. D. 1995. *Iz drevneishego proshlogo nizhnego po Don'ya*. St. Petersburg: IIMK.
- Bellwood, Peter. 2001. Early agriculturalist population diasporas? Farming, language, and genes. *Annual Review of Anthropology* 30:181–207.
- Bellwood, Peter, and Colin Renfrew, eds. 2002. *Examining the Farming/Language Dispersal Hypothesis*. Cambridge: McDonald Institute for Archaeological Research.
- Bendrey, Robin. 2007. New methods for the identification of evidence for bitting on horse remains from archaeological sites. *Journal of Archaeological Science* 34:1036–1050.
- Benecke, Norbert. 1997. Archaeozoological studies on the transition from the Mesolithic to the Neolithic in the North Pontic region. *Anthropozoologica* 25–26:631–641.
- . 1994. *Archäologische Studien zur Entwicklung der Haustierhaltung in Mitteleuropa und Südskandinavien von Anfängen bis zum Ausgehenden Mittelalter*. Berlin: Akademie Verlag.
- Benecke, Norbert, and Angela von den Dreisch. 2003. Horse exploitation in the Kazakh steppes during the Eneolithic and Bronze Age. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 69–82. Cambridge: McDonald Institute for Archaeological Research.
- Benveniste, Emile. 1973 [1969]. *Indo-European Language and Society*. Translated by Elizabeth Palmer. Coral Gables, Fla.: University of Miami Press.
- Berger, Joel. 1986. *Wild Horses of the Great Basin: Social Competition and Population Size*. Chicago: University of Chicago Press.
- Berezanskaya, S. S. 1979. Pervye mastera-metallurgi na territorii Ukrayny. In *Pervobytnaya arkheologiya: poiski i nakhodki*, ed. N. N. Bondar and D. Y. Telegin, pp. 243–256. Kiev: Naukova Dumka.
- Bibby, Geoffrey. 1956. *The Testimony of the Spade*. New York: Knopf.
- Bibikov, S. N. 1953. *Rannetropol'skoe Poselenie Luka-Vrublevetskaya na Dnestre*. Materialy i issledovaniya po arkheologii SSR 38. Moscow: Akademii Nauk SSSR.
- Bibikova, V. I. 1970. K izucheniyu drevneishikh domashnikh loshadei vostochnoi Evropy, soobshchenie 2. *Biulleten moskovskogo obshchestva ispytatelei prirodi otdel biologicheskii* 75 (5): 118–126.
- . 1967. K izucheniyu drevneishikh domashnikh loshadei vostochnoi Evropy. *Biulleten moskovskogo obshchestva ispytatelei prirodi Otdel Biologicheskii* 72 (3): 106–117.
- Bickerton, D. 1988. Creole languages and the bioprogram. In *Linguistics: The Cambridge Survey*, vol. 2 ed. F. J. Newmeyer, pp. 267–284. Cambridge: Cambridge University Press.
- Binford, Lewis. 1971. Mortuary practices: Their study and their potential. In *Approaches to the Social Dimensions of Mortuary Practices*, ed. James A. Brown, pp. 92–112. Memoirs No. 25. Washington, D.C.: Society for American Archaeology.
- Blyakharchuk, T. A., H. E. Wright, P. S. Borodavko, W. O. van der Knaap, and B. Ammann. 2004. Late Glacial and Holocene vegetational changes on the Ulagan high-mountain plateau, Altai Mts., southern Siberia. *Palaeogeography, Paleoclimatology, and Paleoecology* 209:259–279.
- Bloch, Maurice E. F. 1998. Time, narratives, and the multiplicity of representations of the past. In *How We Think They Think*, ed. Maurice E. F. Bloch, 100–113. Boulder, CO: Westview Press.
- Boaz, Franz. 1911. Introduction. In *Handbook of American Indian Languages*, pt. 1, pp. 1–82. Bulletin 40. Washington, D.C.: Bureau of American Ethnology.

- Bobomulloev, Saidmurad. 1997. Ein bronzezeitliches Grab aus Zardča Chalifa bei Pendžikent (Zeravšan-Tal). *Archäologische Mitteilungen aus Iran und Turan* 29:122–134.
- Bobrinskii, A. A., and I. N. Vasilieva. 1998. O nekotorykh osobennostyakh plasticheskogo syr'ya v istorii goncharstva. In *Problemy drevnei istorii severnogo prikasiya*, pp. 193–217. Samara: Institut istorii i arkheologii povolzh'ya.
- Bobrov, V. V. 1988. On the problem of interethnic relations in South Siberia in the third and second millennia BC. *Arctic Anthropology* 25 (2): 30–46.
- Bodyans'kii, O. V. 1968. Eneolitichni mogil'nik bilya s. Petyro-Svistunovo. *Arkheologiya* (Kiev) 21:117–125.
- Bogucki, Peter. 1988. *Forest Farmers and Stockherders*. Cambridge: Cambridge University Press.
- Bökönyi, Sandor. 1991. Late Chalcolithic horses in Anatolia. In *Equids in the Ancient World*, ed., Richard Meadow and Hans-Peter Uerpman, vol. 2, pp. 123–131. Wiesbaden: Ludwig Reichert.
- . 1987. Horses and sheep in East Europe. In *Proto-Indo-European: The Archaeology of a Linguistic Problem*, ed. Susan Skomal, pp. 136–144. Washington, D.C.: Institute for the Study of Man.
- . 1983. Late Chalcolithic and Early Bronze I animal remains from Arslantepe (Malatya), Turkey: A preliminary report. *Origini* 12 (2): 581–598.
- . 1979. Copper age vertebrate fauna from Kétegyháza. In *The People of the Pit-Grave Kur-gans in Eastern Hungary*, ed. Istvan Ecsedy, pp. 101–116. Budapest: Akademiai Kiado.
- . 1978. The earliest waves of domestic horses in East Europe. *Journal of Indo-European Studies* 6 (1/2): 17–76.
- . 1974. *History of Domestic Animals in Central and Eastern Europe*. Budapest: Akademiai Kiado.
- Bol'shov, S. V. 1995. Problemy kulturogeneza v lesnoi polose srednego povolzh'ya v Abashevskoe vremya. In *Drevnie IndoIranskie Kul'tury Volgo-Ural'ya*, ed. I. B. Vasilev and O. V. Kuz'mina, pp. 141–156. Samara: Samara Gosudarstvennogo Pedagogicheskogo Universiteta.
- Boltenko, M. F. 1957. Stratigrafiya i khronologiya Bol'shogo Kulial'nika. *Materiali i issledovaniya po arkheologii severnogo prichernomoriya* (Kiev) 1:21–46.
- Bond, G., Kromer, B., Beer, J., Muscheler, R., Evans, M. N., Showers, W., Hoffmann, S., Lotti-Bond, R., Hajdas, I. and Bonani, G., 2001. Persistent solar influence on North Atlantic climate during the Holocene. *Science* 294:2130–2136.
- Bondar, N. N. and Nechitailo, A. L., eds. 1980. *Arkheologicheskie pamyatniki po ingul'ya*. Kiev: Naukova Dumka.
- Bondar, N. N. 1974. K voprosu o proiskhozhenii sernedneprovskoi kul'tury. *Zborník Filozofickej Fakulty Univerzity Komenského Musaica (Bratislava)* 14:37–53.
- Bonsall, C., G. T. Cook, R. E. M. Hedges, T. F. G. Higham, C. Pickard, and I. Radovanovic. 2004. Radiocarbon and stable isotope evidence of dietary change from the Mesolithic to the Middle Ages in the Iron Gates: New results from Lepenski Vir. *Radiocarbon* 46 (1): 293–300.
- Boriskovskii, Pavel I. 1993. Determining Upper Paleolithic historico-cultural regions. In *From Kostienki to Clovis, Upper Paleolithic: Paleo-Indian Adaptations*, ed. Olga Soffer and N. D. Praslov, pp. 143–147. New York: Plenum.
- Boroffka, Nikolaus. 1998. Bronze- und früheisenzeitliche Geweihtrensenknebel aus Rumänien und ihre Beziehungen. *Eurasia Antiqua* (Berlin) 4:81–135.
- Boroffka, Nikolaus, Jan Cierny, Joachim Lutz, Hermann Parzinger, Ernst Pernicka, and Gerd Weisberger, 2002. Bronze Age tin from central Asia: Preliminary notes. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 135–159, Cambridge: McDonald Institute for Archaeological Research.

- Boyadziev, Yavor D. 1995. Chronology of the prehistoric cultures in Bulgaria. In *Prehistoric Bulgaria*, ed. Douglass W. Bailey and Ivan Panayotov, pp. 149–191. Monographs in World Archaeology 22. Madison, Wis.: Prehistory Press.
- Boyce, Mary. 1975. *A History of Zoroastrianism*. Vol. 1. Leiden: Brill.
- Britain, David. 2002. Space and spatial diffusion. In *The Handbook of Language Variation and Change*, ed. J. Chambers, P. Trudgill, and N. Schilling-Estes, pp. 603–637. Oxford: Blackwell.
- Boyle, Katie, Colin Renfrew, and Marsha Levine, eds. 2002. *Ancient Interactions: East and West in Eurasia*. Cambridge: McDonald Institute for Archaeological Research.
- Bradley D. G., D. E. MacHugh, P. Cunningham, and R. T. Loftus. 1996. Mitochondrial diversity and the origins of African and European cattle. *Proceedings of the National Academy of Sciences* 93 (10): 5131–5135.
- Bratchenko, S. N. 2003. Radiocarbon chronology of the Early Bronze Age of the Middle Don, Svatove, Luhansk region. *Baltic-Pontic Studies* 12:185–208.
- . 1976. *Nizhnee Podone v Epokhu Srednei Bronzy*. Kiev: Naukova Dumka.
- . 1969. Bagatoshia rove poselennya Liventsivka I na Donu. *Arkeologija* (Kiev) 22:210–231.
- Breen, T. H. 1984. Creative adaptations: Peoples and cultures. In *Colonial British America*, ed. Jack P. Green and J. R. Pole, pp. 195–232. Baltimore, Md.: Johns Hopkins University Press.
- Britain, David. 2004. Geolinguistics—Diffusion of Language. In *Sociolinguistics: International Handbook of the Science of Language and Society* vol. 1, ed. Ulrich Ammon, Norbert Dittmar, Klaus J. Mattheier, and Peter Trudgill, pp. 34–48, Berlin: Mouton de Gruyter.
- Bronicki, Andrzej, Sławomir Kadrow, and Anna Zakościelna. 2003. Radiocarbon dating of the Neolithic settlement in Zimne, Volhynia. *Baltic-Pontic Studies* 12:22–66.
- Bronitsky, G., and R. Hamer. 1986. Experiments in ceramic technology: The effects of various tempering material on impact and thermal-shock resistance. *American Antiquity* 51 (1): 89–101.
- Broodbank, Cyprian. 1989. The longboat and society in the Cyclades in the Keros-Syros culture. *American Journal of Archaeology* 85:318–337.
- Broodbank, Cyprian, and T. F. Strasser. 1991. Migrant farmers and the colonization of Crete. *Antiquity* 65:233–245.
- Brown, D. R., and David W. Anthony. 1998. Bit wear, horseback riding, and the Botai site in Kazakhstan. *Journal of Archaeological Science* 25:331–347.
- Bryce, T. 1998. *The Kingdom of the Hittites*. Oxford: Clarendon.
- Buchanan, Briggs. 1966. *Catalogue of Ancient Near Eastern Seals in the Ashmolean Museum*. Vol. 1, *Cylinder Seals*. Oxford: Clarendon.
- Buck, Carl Darling. 1949. *A Dictionary of Selected Synonyms in the Principal Indo-European Languages*. Chicago: University of Chicago Press.
- Bunyatyan, Katerina P. 2003. Correlations between agriculture and pastoralism in the northern Pontic steppe area during the Bronze Age. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 269–286. Cambridge: McDonald Institute for Archaeological Research.
- Burdo, Natalia B. 2003. Cultural contacts of early Tripolye tribes. Paper delivered at the Ninth Annual Conference of the European Association of Archaeologists. St Petersburg, Russia.
- Burdo, Natalia B., and V. N. Stanko. 1981. Eneoliticheskie nakhodki na stoianke Mirnoe. In *Drevnosti severo-zapadnogo prichernomor'ya*, pp. 17–22. Kiev: Naukova Dumka.
- Burmeister, Stefan. 2000. Archaeology and migration: Approaches to an archaeological proof of migration. *Current Anthropology* 41 (4): 554–555.
- Burov, G. M. 1997. Zimni transport severnoi Evropy i Zaural'ya v epokhu Neolita i rannego metalla. *Rossiskaya arkeologiya* 4:42–53.
- Burrow, T. 1973. The Proto-Indoaryans. *Journal of the Royal Asiatic Society* (n. s.) 2:123–40.
- Bynon, Theodora. 1977. *Historical Linguistics*. Cambridge: Cambridge University Press.
- Cameron, Catherine, and Steve A. Tomka, eds. 1993. *Abandonment of Settlements and Regions: Ethnoarchaeological and Archaeological Approaches*. Cambridge: Cambridge University Press.

- Campbell, Lyle. 2002. What drives linguistic diversification and language spread? In *Examining the Farming/Language Dispersal Hypothesis*, ed. Peter Bellwood and Colin Renfrew, pp. 49–63. Cambridge: McDonald Institute for Archaeological Research.
- Cannon, Garland. 1995. “Oriental Jones: Scholarship, Literature, Multiculturalism, and Humankind.” In *Objects of Enquiry: The Life, Contributions, and Influences of Sir William Jones*, pp. 25–50. New York: New York University Press.
- Carpelan, Christian, and Asko Parpola. 2001. Emergence, contacts and dispersal of Proto-Indo-European, proto-Uralic and proto-Aryan in archaeological perspective. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpola, and Petteri Koskikallio, pp. 55–150. Memoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- Castile, George Pierre, and Gilbert Kushner, eds. 1981. *Persistent Peoples: Cultural Enclaves in Perspective*. Tucson: University of Arizona Press.
- Chambers, Jack, and Peter Trudgill. 1998. *Dialectology*. Cambridge: Cambridge University Press.
- Chapman, John C. 1999. The origins of warfare in the prehistory of Eastern and central Europe. In *Ancient Warfare: Archaeological Perspectives*, ed. John Carman and Anthony Harding, pp. 101–142. Phoenix Mill: Sutton.
- . 1989. The early Balkan village. In *The Neolithic of Southeastern Europe and Its Near Eastern Connections*, ed. Sándor Bökonyi, pp. 33–53. Budapest: Varia Archaeologica Hungarica II.
- . 1983. The Secondary Products Revolution and the limitations of the Neolithic. *Bulletin of the Institute of Archaeology* (London) 19:107–122.
- Cherniakov, I. T., and G. N. Toshchev. 1985. Kul’turno-khronologicheskie osobennosti kurgannykh pogrebenii epokhi Bronzy nizhnego Dunaya. In *Novye Materialy po Arkheologii Severnogo-Zapadnogo Prichernomor’ya*, ed. V. N. Stanko, pp. 5–45, Kiev: Naukovo Dumka.
- Chernopitskii, M. P. 1987. Maikopskii “baldachin.” *Kratkie soobshcheniya institutu arkheologii* 192:33–40.
- Chernykh, E. N., ed. 2004. *Kargaly*. Vol. 3, *Arkheologicheskie materialy, tekhnologiya gorno-metallurgicheskogo proizvodstva, arkheobiologicheskie issledovaniya*. Moscow: Yaziki slavyanskoi kul’tury.
- . 1997. *Kargaly: Zabytyi Mir*. Moscow: NOX.
- . 1995. Postscript: Russian archaeology after the collapse of the USSR: Infrastructural crisis and the resurgence of old and new nationalisms. In *Nationalism, Politics, and the Practice of Archaeology*, ed. Philip L. Kohl and Clare Fawcett, pp. 139–148, Cambridge: Cambridge University Press.
- . 1992. *Ancient Metallurgy in the USSR*. Cambridge: Cambridge University Press.
- Chernykh, E. N., and K. D. Isto. 2002. Nachalo ekspluatsii Kargalov: Radiouglerosnyi daty. *Rossiiskaya arkheologiya* 2: 44–55.
- Chernykh, E. N., E. V. Kuz’minykh, and L. B. Orlovskaya. 2004. Ancient metallurgy of northeast Asia: From the Urals to the Saiano-Altai. In *Metallurgy in Ancient Eastern Eurasia from the Urals to the Yellow River*, ed. Katheryn M. Linduff, pp. 15–36. Lewiston, Me.: Edwin Mellen.
- Chernysh, E. K. 1982. Eneolit pravoberezhnoi Ukrayini i Moldavii. In *Eneolit SSSR*, ed. V. M. Masson and N. Y. Merpert, pp. 165–320. Moscow: Nauka.
- Childe, V. Gordon. 1957. *The Dawn of European Civilization*. 6<sup>th</sup> ed. London: Routledge Kegan Paul.
- . 1936. The axes from Maikop and Caucasian metallurgy. *Annals of Archaeology and Anthropology* (Liverpool) 23:113–119.
- Chilton, Elizabeth S. 1998. The cultural origins of technical choice: Unraveling Algonquian and Iroquoian ceramic traditions in the Northeast. In *The Archaeology of Social Boundaries*, ed. Miriam Stark, pp. 132–160. Washington, D.C.: Smithsonian Institution Press.

- Chretien, C. D. 1962. The mathematical models of glottochronology. *Language* 38:11–37.
- Christensen, A. F., Brian E. Hemphill, and Samar I. Mustafakulov. 1996. Bactrian relationships to Russian and Central Asian populations: A craniometric assessment. *American Journal of Physical Anthropology* 22:84–85.
- Clackson, James. 1994. *The Linguistic Relationship between Greek and Armenian*. Oxford: Blackwell.
- Clark, Geoffrey. 1994. Migration as an explanatory concept in Paleolithic archaeology. *Journal of Archaeological Method and Theory* 1 (4): 305–343.
- Clark, Grahame. 1941. Horses and battle-axes. *Antiquity* 15 (57): 50–69.
- Clayton, Hilary. 1985. A fluoroscopic study of the position and action of different bits in the horse's mouth. *Equine Veterinary Science* 5 (2): 68–77.
- Clayton, Hilary M., and R. Lee. 1984. A fluoroscopic study of the position and action of the jointed snaffle bit in the horse's mouth. *Equine Veterinary Science* 4 (5): 193–196.
- Clutton-Brock, Juliet. 2003. Were the donkeys of Tell Brak harnessed with a bit? In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 126–127. Cambridge: McDonald Institute for Archaeological Research.
- . 1974. The Buhen horse. *Journal of Archaeological Science* 1:89–100.
- Cole, John W., and Eric Wolf. 1974. *The Hidden Frontier: Ecology and Ethnicity in an Alpine Valley*. New York: Academic Press.
- Coleman, John. 2000. An archaeological scenario for the “Coming of the Greeks” ca. 3200 BC.” *Journal of Indo-European Studies* 28 (1–2): 101–153.
- Comsa, Eugen. 1976. Quelques considerations sur la culture Gumelnitsa. *Dacia* 20:105–127.
- Cook, G. T., C. Bonsall, R. E. M. Hedges, K. McSweeney, V. Boroneanț, L. Bartosiewicz, and P. B. Pettitt, 2002. Problems of dating human bones from the Iron Gates. *Antiquity* 76:77–85.
- Cronk, Lee. 1993. CA comment on transitions between cultivation and pastoralism in Sub-Saharan Africa. *Current Anthropology* 34 (4): 374.
- . 1989. From hunters to herders: Subsistence change as a reproductive strategy. *Current Anthropology* 30:224–34.
- Crouwel, Joost H. 1981. *Chariots and Other Means of Land Transport in Bronze Age Greece*. Allard Pierson Series 3. Amsterdam: Allard Pierson Museum.
- Dalton, G. 1977. Aboriginal economies in stateless societies. In *Exchange Systems in Prehistory*, ed. Timothy Earle and J. Ericson, pp. 191–212, New York: Academic Press.
- Danilenko, V. M. 1971. *Bugo-Dnistrov's'ka Kul'tura*. Kiev: Dumka.
- Darden, Bill J. 2001. On the question of the Anatolian origin of Indo-Hittite. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 184–228. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- . 2004. Who were the Sclaveni and where did they come from? *Byzantinische Forschungen* 28:133–157.
- Davis, E. M. 1983. The gold of the shaft graves: The Transylvanian connection. *Temple University Aegean Symposium* 8:32–38.
- Davis, Simon J. M. 1987. *The Archaeology of Animals*. New Haven: Yale University Press.
- Davis-Kimball, Jeannine. 1997. Warrior women of the Eurasian steppes. *Archaeology* 50 (1): 44–49.
- DeBoer, Warren. 1990. Interaction, imitation, and communication as expressed in style: The Ucayali experience. In *The Uses of Style in Archaeology*, ed. M. Conkey and Christine Hastorf, pp. 82–104. Cambridge: Cambridge University Press.
- . 1986. Pillage and production in the Amazon: A view through the Conibo of the Ucayali Basin, eastern Peru. *World Archaeology* 18 (2): 231–246.
- Dennell, R. W., and D. Webley. 1975. Prehistoric settlement and land use in southern Bulgaria. In *Palaeoeconomy*, ed. E. S. Higgs, pp. 97–110. Cambridge: Cambridge University Press.
- Dergachev, Valentin A. 2003. Two studies in defense of the migration concept. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 93–112. McDonald Institute Monographs. Cambridge: University of Cambridge Press.

- . 1999. Cultural-historical dialogue between the Balkans and Eastern Europe (Neolithic-Bronze Age). *Thraco-Dacica* 20 (1–2): 33–78.
- . 1998a. *Karbunskii Klad*. Kishinev: Academiei Štiințe.
- . 1998b. Kulturell und historische Entwicklungen im Raum zwischen Karpaten und Dnepr. In *Das Karpatenbecken und Die Osteuropäische Steppe*, ed. Bernhard Hänsel and Jan Machnik, pp. 27–64. München: Südosteuropa-Schriften Band 20, Verlag Marie Leidorf GmbH.
- . 1980. *Pamyatniki Pozdnego Tripol'ya*. Kishinev: Shtiintsa.
- Dergachev, V., A. Sherratt, and O. Larina. 1991. Recent results of Neolithic research in Moldavia (USSR). *Oxford Journal of Prehistory* 10 (1): 1–16.
- Derin, Z., and Oscar W. Muscarella. 2001. Iron and bronze arrows. In *Ayanis I. Ten Years' Excavations at Rusahinili Eiduru-kai 1989–1998*, ed. A. Çilingiroğlu and M. Salvini, pp. 189–217. Roma: Documenta Asiana VI ISMEA.
- Diakonov, I. M. 1988. Review of *Archaeology and Language. Annual of Armenian Linguistics* 9:79–87.
- . 1985. On the original home of the speakers of Indo-European. *Journal of Indo-European Studies* 13 (1–2): 93–173.
- Diamond, Jared. 1997. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: Norton.
- DiCosmo, Nicola. 2002. *Ancient China and Its Enemies: The Rise of Nomadic Power in East Asian History*. Cambridge: Cambridge University Press.
- . 1999. State Formation and periodization in Inner Asian prehistory. *Journal of World History* 10 (1): 1–40.
- . 1994. Ancient Inner Asian Nomads: Their Economic basis and its significance in Chinese history. *Journal of Asian Studies* 53 (4): 1092–1126.
- Diebold, Richard. 1985. *The Evolution of the Nomenclature for the Salmonid Fish: The Case of "buchen" (Hucho spp.)*. Journal of Indo-European Studies Monograph 5. Washington, D.C.: Institute for the Study of Man.
- Dietler, Michael, and Brian Hayden, eds. 2001. *Feasts*. Washington, D.C.: Smithsonian Institution Press.
- Dietz, Ute Luise. 1992. Zur frage vorbronzezeitlicher Trensenbelege in Europa. *Germania* 70 (1): 17–36.
- Dixon, R. M. W. 1997. *The Rise and Fall of Languages*. Cambridge: Cambridge University Press.
- Dobrovolskii, A. V. 1958. Mogil'nik vs. Chapli. *Arkhеologiya* (Kiev) 9:106–118.
- Dodd-Opritescu, 1978, Les elements steppiques dans l'Énéolithique de Transylvanie. *Dacia* 22:87–97.
- Dolukhanov, P. M. 1986. Foragers and farmers in west-Central Asia. In *Hunters in Transition*, ed. Marek Zvelebil, pp. 121–132. Cambridge: Cambridge University Press.
- Donnan, Hastings, and Thomas M. Wilson. 1999. *Borders: Frontiers of Identity, Nation, and State*. Oxford: Berg.
- Dorian, N. 1981. *Language Death: The Life Cycle of a Scottish Gaelic Dialect*. Philadelphia: University of Pennsylvania Press.
- Dovchenko, N. D., and N. A. Rychkov. 1988. K probleme sotsial'noi stratigrafikatsii plemen Yamnoi kul'turno-istoricheskoi obshchnosti. In *Novye Pamyatniki Yamnoi Kul'tury Steppoi Zony Ukrayny*, pp. 27–40. Kiev: Naukova Dumka.
- Dremov, I. I., and A. I. Yudin. 1992. Drevneishie podkurgannye zakhоронения stepnogo zaVolzh'ya. *Rossiskaya arkheologiya* 4:18–31.
- Drews, Robert. 2004. *Early Riders*. London: Routledge.
- , ed. 2001. *Greater Anatolia and the Indo-Hittite Language Family*. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- . 1988. *The Coming of the Greeks: Indo-European Conquests in the Aegean and the Ancient Near East*. Princeton, N. J.: Princeton University Press.

- Drinka, Bridget. 1995. Areal linguistics in prehistory: Evidence from Indo-European aspect. In *Historical Linguistics 1993*, ed. Henning Andersen, pp. 143–158. Amsterdam: John Benjamins.
- Dumezil, Georges. 1958. *L'Idéologie Tripartie des Indo-Européens*. Brussels: Latomus.
- Dumitrescu, Vladimir. 1980. Tumuli from the period of transition from the Eneolithic to the Bronze Age excavated near Rast. In *The Neolithic Settlement at Rast*, appendix 3, pp. 126–133. British Archaeological Reports International Series 72. Oxford: Archaeopress.
- During Caspers, E. C. L. 1998. The MBAC and the Harappan script. *Ancient Civilizations from Scythia to Siberia* 5 (1): 40–58.
- Dyen, I., J. B. Kruskal, and P. Black. 1992. An Indo-European classification: A lexicostatistical experiment. *Transactions of the American Philosophical Society* 82 (5): 1–132.
- Ecsedy, István. 1994. “Camps for eternal rest: Some aspects of the burials by the earliest nomads of the steppes.” In *The Archaeology of the Steppes: Methods and Strategies*, ed. Bruno Genito, pp. 167–176. Napo: Instituto universitario orientale series minor 44.
- , ed. 1979. *The People of the Pit-Grave Kurgans in Eastern Hungary*. Budapest: Akadémia Kiadó.
- Ehrich, Robert W. 1961. On the persistence and recurrences of culture areas and culture boundaries during the course of European prehistory, protohistory, and history. In *Berichte über den V Internationalen Kongress für Vor- und Frühgeschichte*, pp. 253–257. Berlin: Gebrüder Mann.
- Eisler, Riane. 1990. The Gaia tradition and the partnership future: An ecofeminist manifesto. In *Reweaving the World*, ed. Irene Diamond and G. F. Orenstein, pp. 23–34. San Francisco: Sierra Club Books.
- . 1987. *The Chalice and the Blade*. San Francisco: Harper and Row.
- Eleure, C., ed. 1989. *Le Premier Or de l'Humanité en Bulgarie 5e millénaire*. Paris: Musées Nationaux.
- Ellis, Linda. 1984. *The Cucuteni-Tripolye Culture: A Study in Technology and the Origins of Complex Society*. British Archaeological Reports International Series 217. Oxford: Archaeopress.
- Emberling, Geoff. 1997. Ethnicity in complex societies: Archaeological perspectives. *Journal of Archaeological Research* 5 (4): 295–344.
- Embleton, Sheila. 1991. Mathematical methods of genetic classification. In *Sprung from Some Common Source: Investigations into the Prehistory of Languages*, ed. Sidney Lamb and E. Douglass Mitchell, pp. 365–388. Stanford: Stanford University Press.
- . 1986. *Statistics in Historical Linguistics*. Bochum: Brockmeyer.
- Enattah, Nabil Sabri. 2005. *Molecular Genetics of Lactase Persistence*. Ph.D. dissertation, Department of Medical Genetics, Faculty of Medicine, University of Helsinki, Finland.
- Epimakhov, A. V. 2002. *Iuzhnoe zaural'e v epokhu srednei bronzы*. Chelyabinsk: YUrGU.
- Epimakhov, A., B. Hanks, and A. C. Renfrew. 2005. Radiocarbon dating chronology for the Bronze Age monuments in the Transurals, Russia. *Rossiiskaja Arkheologija* 4:92–102.
- Erdosy, George, ed. 1995. *The Indo-Aryans of Ancient South Asia: Language, Material Culture and Ethnicity*. Indian Philology and South Asian Studies 1. Berlin: Walter de Gruyter.
- Euler, Wolfram. 1979. *Indoiranisch-griechische Gemeinsamkeiten der Nominalbildung und deren Indogermanische Grundlagen*. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck, vol. 30.
- Evdokimov, V. V., and V. G. Loman. 1989. Raskopi Yamnogo kurgana v Karagandinskoi Oblasti. In *Voprosy arkheologii tsestral'nogo i severnogo Kazakhstana*, ed. K.M. Baipakov, pp. 34–46. Karaganda: Karagandinskii gosudarstvennyi universitet.
- Ewers, John C. 1955. *The Horse in Blackfoot Indian Culture*. Washington, D.C.: Smithsonian Institution Press.
- Falk, Harry. 1986. *Bruderschaft und Wülferspiel*. Freiburg: Hedwig Falk.

- Fiedel, Stuart, and David W. Anthony. 2003. Deerslayers, pathfinders, and icemen: Origins of the European Neolithic as seen from the frontier. In *The Colonization of Unfamiliar Landscapes*, ed. Marcy Rockman and James Steele, pp. 144–168. London: Routledge.
- Fischer, David Hackett. 1989. *Albion's Seed: Four British Folkways in America*. New York: Oxford University Press.
- Fitzgerald-Huber, Louise G. 1995. Qijia and Erlitou: The question of contacts with distant cultures. *Early China* 20:17–67.
- Florin, Curta. 2001. *The Making of the Slavs*. Oxford: Oxford University Press.
- Forenbaher, S. 1993. Radiocarbon dates and absolute chronology of the central European Early Bronze Age. *Antiquity* 67:218–256.
- Forsén, J. 1992. *The Twilight of the Early Helladiques: A Study of the Disturbances in East-Central and Southern Greece toward the End of the Early Bronze Age*. Jonsered, Sweden: P. Åströms Förlag.
- Fortson, Benjamin W., IV. 2004. *Indo-European Language and Culture: An Introduction*. Oxford: Blackwell.
- Fox, John W. 1987. *Maya Postclassic State Formation*. Cambridge: Cambridge University Press.
- Francis, E. D. 1992. The impact of non-Indo-European languages on Greek and Mycenaean. In *Reconstructing Languages and Cultures*, ed. E. Polome and W. Winter, pp. 469–506. Trends in Linguistics: Studies and Monographs 58. Berlin: Mouton de Gruyter.
- French, Charly, and Maria Kousoulakou. 2003. Geomorphological and micro-morphological investigations of paleosols, valley sediments and a sunken-floored dwelling at Botai, Kazakhstan. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 105–114. Cambridge: McDonald Institute for Archaeological Research.
- Fried, Morton H. 1975. *The Notion of Tribe*. Menlo Park, Calif.: Cummings.
- Friedrich, Paul. 1970. *Proto-Indo-European Trees*. Chicago: University of Chicago Press.
- Gaiduchenko, L. L. 1995. Mesto i znachenie Iuzhnogo Urala v eksportno-importnikh operatsiyakh po napravleniu vostok-zapad v eopkhu bronzy. In *Rossiya i vostok: Problemy vzaimodeistviya*, pt. 5, bk. 1: *Kul'tury eneolita-bronzy stepnoi evrazii*, pp. 110–115. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- Gal, S. 1978. *Language Shift: Social Determinants of Linguistic Change in Bilingual Austria*. New York: Academic Press.
- Gallusser, W. A. 1991. Geographical investigations in boundary areas of the Basle region ("Region"). In *The Geography of Border Landscapes*, ed. D. Rumley and J. V. Minghi, pp. 32–42. London: Routledge.
- Gamkrelidze, Thomas V., and Vyacheslav Ivanov. 1995. *Indo-European and the Indo-Europeans: A Reconstruction and Historical Analysis of a Proto-Language and a Proto-Culture*. Vol. 1. Translated by Johanna Nichols. Edited by Werner Winter. Trends in Linguistics: Studies and Monographs 80. Berlin: Mouton de Gruyter.
- . 1984. *Indoevropeiskii iazyk i indoevropeitsy*. Tiflis: Tbilisskogo Universiteta.
- . 1973. Sprachtypologie und die Rekonstruktion der gemeinindogermanischen Verschlüsse. *Phonetica* 27:150–156.
- Gei, A. N. 2000. *Novotitorovskaya kul'tura*. Moscow: Institut Arkheologii.
- . 1990. Poyt paleodemograficheskogo analiza obshchestva stepnykh skotovodov epokhi bronzy: po pogrebal'nym pamyatnikam prikuban'ya. *Kratkie Soobshcheniya Institut Arkheologii* 201:78–87.
- . 1986. Pogrebenie liteishchika Novotitorovskoi kul'tury iz nizhnego pri kuban'ya. In *Arkheologicheskie Otkrytiya na Novostroikakh: Drevnosti severnogo kavkaza* (Moscow) 1:13–32.
- . 1979. Samsonovskoe mnogosloinoe poselenie na Donu. *Sovetskaya arkheologiya* (2): 119–131.
- Gellner, Ernest. 1973. *Nations and Nationalism*. Ithaca, N.Y.: Cornell University Press.
- Gening, V. F. 1979. The cemetery at Sintashta and the early Indo-Iranian peoples. *Journal of Indo-European Studies* 7:1–29.

- Gening, V. F., G. B. Zdanovich, and V. V. Gening. 1992. *Sintashta*. Chelyabinsk: Iuzhnouralskoe knizhnoe izdatel'stvo.
- George, Christian. 2002. *Quantification of Wear in Equus Teeth from Florida*. MA thesis, Department of Geological Sciences, University of Florida, Gainesville.
- Georgieva, P. 1990. Ethnocultural and socio-economic changes during the transitional period from Eneolithic to Bronze Age in the region of the lower Danube. *Glasnik Centara za Balkanoloških Ispitavanja* 26:123–154.
- Gheorgiu, Drago. 1994. Horse-head scepters: First images of yoked horses. *Journal of Indo-European Studies* 22 (3–4): 221–250.
- Ghetie, B., and C. N. Mateesco. 1973. L'utilisation des bovines à la traction dans le Néolithique Moyen. *International Conference of Prehistoric and Protohistoric Sciences* (Belgrade) 10:454–461.
- Giddens, Anthony. 1985. *The Nation-state and Violence*, Cambridge: Polity.
- Gilbert, Allan S. 1991. Equid remains from Godin Tepe, western Iran: An interim summary and interpretation, with notes on the introduction of the horse into Southwest Asia. In *Equids in the Ancient World*, vol. 2, ed. Richard H. Meadow and Hans-Peter Uerpmann, pp. 75–122. Wiesbaden: Reichert.
- Gilman, Antonio. 1981. The development of social stratification in Bronze Age Europe. *Current Anthropology* 22 (1): 1–23.
- Gimbutas, Marija. 1991. *The Civilization of the Goddess*. San Francisco: Harper.
- . 1989a. *The Language of the Goddess*. London: Thames and Hudson.
- . 1989b. Women and culture in Goddess-oriented Old Europe. In *Weaving the Visions*, ed. Judith Plaskow, and C. C. Christ, pp. 63–71. San Francisco: Harper and Row.
- . 1977. The first wave of Eurasian steppe pastoralists into Copper Age Europe. *Journal of Indo-European Studies* 5 (4): 277–338.
- . 1974. *The Goddesses and Gods of Old Europe: Myths and Cult Images (6500–3500 B.C.)*, London: Thames and Hudson.
- . 1970. Proto-Indo-European culture: The Kurgan Culture during the fifth, fourth, and third millennia B.C. In *Indo-European and the Indo-Europeans*, ed. George Cardona, Henry Hoenigswald, and Alfred Senn, pp. 155–198. Philadelphia: University of Pennsylvania Press.
- . 1956. *The Prehistory of Eastern Europe, Part 1*. Cambridge: American School of Prehistoric Research Bulletin 20.
- Glassie, Henry. 1965. *Pattern in the Material Folk Culture of the Eastern United States*. Philadelphia: University of Pennsylvania Press.
- Glonti, L. I. and A. I. Dzhavakhishvili. 1987. Novye dannye o mnogosloinom pamyatniki epokhi Eneolita-Pozdnei Bronzy v shida Kartli-Berkdeebi. *Kratkie Soobshcheniya Institut Arkheologii* 192:80–87.
- Glumac, P. D., and J. A. Todd. 1991. Eneolithic copper smelting slags from the Middle Danube basin. In *Archaeometry '90*, ed. Ernst Pernicka and Günther A. Wagner, pp. 155–164. Basel: Birkhäuser Verlag.
- Glumac, Petar, and David W. Anthony. 1992. Culture and environment in the prehistoric Caucasus, Neolithic to Early Bronze Age. In *Chronologies in Old World Archaeology*, 3rd ed., ed. Robert Ehrich, pp. 196–206. Chicago: Aldine.
- Golyeva, A. A. 2000. Vzaimodeistvie cheloveka i prirody v severo-zapadnom Prikaspii v epokhu Bronzy. In *Sezonnyi ekonomicheskii tsikl naseleniya severo-zapadnogo Prikasiya v Bronzovom Veke*, vol. 120, ed. N. I. Shishlina, pp. 10–29. Moscow: Trudy gosudarstvennogo istoricheskogo muzeya.
- Good, Irene. 2001. Archaeological textiles: A review of current research. *Annual Review of Anthropology* 30:209–226.
- . 1998. Bronze Age cloth and clothing of the Tarim Basin: The Chärchän evidence. In *The Bronze Age and Early Iron Age Peoples of Eastern Central Asia*, ed. Victor Mair, vol. 2,

- pp. 656–668. *Journal of Indo-European Studies Monograph* 26. Washington, D.C.: Institute for the Study of Man.
- Gorbunova, Natalya G. 1993/94. Traditional movements of nomadic pastoralists and the role of seasonal migrations in the formation of ancient trade routes in Central Asia. *Silk Road Art and Archaeology* 3:1–10.
- Gothenstrom, A., C. Anderung, L. Hellborg, R. Elburg, C. Smith, D. G. Bradley, H. Ellegren 2005. Cattle domestication in the Near East was followed by hybridization with aurochs bulls in Europe. *Proceedings of Biological Sciences* 272 (1579): 2337–44.
- Govedarica, B., and E. Kaiser. 1996. Die äneolithischen abstrakten und zoomorphen Steinzepter Südosteuropas. *Eurasia Antiqua* 2:59–103.
- Grant, Madison. 1916. *The Passing of the Great Race; or, The Racial Basis of European History*. New York: Scribner's.
- Gray, Russell D., and Quentin D. Atkinson. 2003. Language-tree divergence times support the Anatolian theory of Indo-European origin. *Nature* 426 (6965): 435–439.
- Greenfield, Haskell. 1994. Preliminary report on the 1992 excavations at Foeni-Sălaş: An early Neolithic Starčevo-Criș settlement in the Romanian Banat. *Analele Banatului* 3:45–93.
- . 1999. The advent of transhumant pastoralism in temperate southeast Europe: A zooarchaeological perspective from the central Balkans. In *Transhumant Pastoralism in Southern Europe*, ed. L. Bartosiewicz and Haskell Greenfield, pp. 15–36. Budapest: Archaeolingua.
- Gremillion, Kristen J. 2004. Seed processing and the origins of food production in eastern North America. *American Antiquity* 69 (2): 215–233.
- Grigoriev, Stanislav A. 2002. *Ancient Indo-Europeans*. Chelyabinsk: RIFEI.
- Gudkova, A. V., and I. T. Chernyakov. 1981. Yamnye pogrebeniya s kolesami u s. Kholmskoe. In *Drevnosti severo-zapanogo prichernomor'ya*, pp. 38–50. Kiev: Naukovo Dumka.
- Guliaev, V. I. 2003. Amazons in the Scythia: New finds at the Middle Don, Southern Russia. *World Archaeology* 35 (1): 112–125.
- Haheu, Vasile, and Serghei Kurciatov. 1993. Cimitirul plan Eneolic de lingă satul Giurgiulești. *Revista Arkheologică* (Kishinev) 1:101–114.
- Hainsworth, J. B. 1972. Some observations on the Indo-European placenames of Greece. In *Acta of the 2nd International Colloquium on Aegean Prehistory*, pp. 39–42. Athens: Ministry of Culture and Sciences.
- Haley, Brian D., and Larry R. Wilcoxon. 2005. How Spaniards became Chumash and other tales of ethnogenesis. *American Anthropologist* 107 (3): 432–445.
- Hall, Jonathan M. 1997. *Ethnic Identity in Greek Antiquity*. Cambridge: Cambridge University Press.
- Hall, Robert A., Jr. 1976. *Proto-Romance Phonology*. New York: Elsevier.
- . 1960. On realism in reconstruction. *Language* 36:203–206.
- . 1950. The reconstruction of Proto-Romance. *Language* 26:6–27.
- Hamp, Eric. 1998. Whose were the Tocharians? In *The Bronze Age and Early Iron Age Peoples of Eastern Central Asia*, ed. Victor H. Mair, vol. 1, pp. 307–346. *Journal of Indo-European Studies Monograph* 26. Washington, D.C.: Institute for the Study of Man.
- Hänsel, B. 1982. Südosteuropa zwischen 1600 und 1000 V. Chr. In *Südosteuropa zwischen 1600 und 1000 V. Chr.*, ed. B. Hänsel, pp. 1–38. Berlin: Moreland Editions.
- Harding, R. M., and R. R. Sokal. 1988. Classification of the European language families by genetic distance. *Proceedings of the National Academy of Sciences* 85:9370–9372.
- Harris, Alice C. 1991. Overview on the history of the Kartvelian languages. In *The Indigenous Languages of the Caucasus*, vol. 1, *The Kartvelian Languages*, ed. Alice C. Harris, pp. 7–83. Delmar, N.Y.: Caravan Books.
- Harris, D. R., ed. 1996. *The Origins and Spread of Agriculture and Pastoralism in Eurasia*. London: University College.

- Häusler, A. 1994. Archäologische Zeugnisse für Pferd und Wagen in Ost- und Mitteleuropa. In *Die Indogermanen und das Pferd: Festschrift für Bernfried Schlerath*, ed. B. Hänsel and S. Zimmer, pp. 217–257. Budapest: Archaeolingua.
- . 1992. “Der ursprung der Wagens in der Diskussion der gegenwart.” *Archäologische Mitteilungen aus Nordwestdeutschland* 15:179–190.
- . 1974. *Die Gräber der älteren Ockergrabkultur zwischen Dnepr und Karpaten*. Berlin: Akadmie-Verlag.
- Hayden, Brian. 2001. Fabulous feasts: A prolegomenon to the importance of feasting. In *Feasts*, ed. M. Dietler, and Brian Hayden, pp.23–64. Washington, D.C.: Smithsonian Institution Press.
- Hayen, Hajo. 1989. Früheste Nachweise des Wagens und die Entwicklung der Transport-Hilfsmittel. *Mitteilungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* 10:31–49.
- Heidegger, Martin. 1959. *An Introduction to Metaphysics*. 1953 [1935]. Translated by Ralph Manheim. New Haven: Yale University Press.
- Helms, Mary. 1992. Long-distance contacts, elite aspirations, and the age of discovery. In *Resources, Power, and Inter-regional Interaction*, ed. Edward M. Schortman and Patricia A. Urban, pp. 157–174. New York: Plenum.
- Hemphill, Brian E., A. F. Christensen, and Samar I. Mustafakulov. 1997. Trade or travel: An assessment of interpopulational dynamics among Bronze-Age Indo-Iranian populations. *South Asian Archaeology, 1995: Proceedings of the 13th Meeting of the South Asian Archaeologists of Europe, Cambridge, UK*, ed. Bridget Allchin, pp. 863–879, Oxford: IBH.
- Hemphill, Brian E., and J. P. Mallory. 2003. Horse-mounted invaders from the Russo-Kazakh steppe or agricultural colonists from western Central Asia? A craniometric investigation of the Bronze Age settlements of Xinjiang. *American Journal of Physical Anthropology* 124 (3): 199–222.
- Hester, D. A. 1957. Pre-Greek placenames in Greece and Asia Minor. *Revue Hittite et Asiatique* 15:107–119.
- Heyd, V., L. Husty, and L. Kreiner. 2004. *Siedlungen der Glockenbecherkultur in Süddeutschland und Mitteleuropa*. Büchenbach: Arbeiten zur Archäologie Süddeutschlands 17 (Dr. Faustus Verlag).
- Hiebert, Frederik T. 2002. Bronze age interaction between the Eurasian steppe and Central Asia. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 237–248, Cambridge: McDonald Institute for Archaeological Research.
- . 1994. *Origins of the Bronze Age Oasis Civilizations of Central Asia*. Bulletin of the American School of Prehistoric Research 42. Cambridge, Mass.: Peabody Museum of Archaeology and Ethnology, Harvard University.
- Hiendleder, Stefan, Bernhard Kaupe, Rudolf Wassmuth, and Axel Janke. 2002. Molecular analysis of wild and domestic sheep. *Proceedings of the Royal Society of London* 269:893–904.
- Hill, Jane. 1996. Languages on the land: Toward an anthropological dialectology. In *David Skomp Distinguished Lectures in Dialectology*. Bloomington: Indiana University Press.
- Hill, Jonathon D. 1992. Contested pasts and the practice of archaeology: Overview. *American Anthropologist* 94 (4): 809–815.
- Hobsbawm, Eric. 1997. *On History*. New York: New Press.
- . 1990. *Nations and Nationalism since 1780*. Cambridge: Cambridge University Press.
- Hock, Hans Henrich, and Brian D. Joseph. 1996. *Language History, Language Change, and Language Relationship: An Introduction to Historical and Comparative Linguistics*. Berlin: Mouton de Gruyter.
- Hodder, Ian. 1990. *The Domestication of Europe: Structure and Contingency in Neolithic Societies*. Cambridge: Cambridge University Press.
- Holden, Clare, and Ruth Mace. 2003. Spread of cattle led to the loss of matriliney in Africa: A co-evolutionary analysis. *Proceedings of the Royal Society B* 270:2425–2433.

- Hopper, Paul. 1973. Glottalized and murmured occlusives in Indo-European. *Glossa* 7:141–166.
- Houwink Ten Cate, P. H. J. 1995. Ethnic diversity and population movement in Anatolia. In *Civilizations of the Ancient Near East*, ed. Jack M. Sasson, John Baines, Gary Beckman, and Karen R. Rubinson, vol. 1, pp. 259–270, New York: Scribner's.
- Hulbert, R. C., G. S. Morgan, and S. D. Webb, eds. 1995. Paleontology and Geology of the Leisey Shell Pits, Early Pleistocene of Florida. *Bulletin of the Florida Museum of Natural History* 37 (1–10).
- Huld, Martin E. 2002. "Linguistic science, truth, and the Indocentric hypothesis." *Journal of Indo-European Studies* 30 (3–4): 353–364.
- . 1990. "The linguistic typology of Old European substrata in north central Europe." *Journal of Indo-European Studies* 18:389–417.
- Hüttel, Hans-Georg. 1992. "Zur archäologischen Evidenz der Pfredenutzung in der Kupfer- und Bronzezeit." In *Die Indogermanen und das Pferd: Festschrift für Bernfried Schlerath*, ed. B. Hänsel and S. Zimmer, pp. 197–215. Archaeolingua 4. Budapest: Archaeolingua Foundation.
- Ilčeva, V. 1993. Localités de période de transition de l'énéolithique à l'âge bronze dans la région de Veliko Tîrnovo. In *The Fourth Millennium B.C.*, ed. Petya Georgieva, pp. 82–98. Sofia: New Bulgarian University.
- Isakov, A. I. 1994. Sarazm: An agricultural center of ancient Sogdiana. *Bulletin of the Asia Institute* (n. s.) 8:1–12.
- Isakov, A. I., Philip L. Kohl, C. C. Lamberg-Karlovsky, and R. Maddin. 1987. Metallurgical analysis from Sarazm, Tadzhikistan SSR. *Archaeometry* 29 (1): 90–102.
- Itina, M. A., and L. T. Yablonskii. 1997. *Saki Nizhnei Syrdar'i*. Moscow: Rosspon.
- Ivanov, I. V., and I. B. Vasiliev. 1995. *Chelovek, Priroda i Pochvy Ryn-Peskov Volgo-Ural'skogo Mezhdurech'ya v Golotsene*. Moscow: Intellekt.
- Ivanova, N. O. 1995. Arkheologicheskaya karta zapovednika Arkaim: Istoriya izucheniya arkheologicheskikh pamyatnikov. In *Arkaim*, ed. G. B. Zdanovich, pp. 159–195. Chelyabinsk: "Kammennyi Poyas."
- Izbitser, Elena. 1993. Wheeled vehicle burials of the steppe zone of Eastern Europe and the Northern Caucasus, 3rd to 2nd millennium B.C. Doctoral Thesis, Institute of the History of Material Culture, St. Petersburg, Russia.
- Jackson, Kenneth H. 1994. *Language and History in Early Britain*. Dublin: Four Courts.
- Jacobs, Kenneth. 1993. Human postcranial variation in the Ukrainian Mesolithic-Neolithic. *Current Anthropology* 34 (3): 311–324.
- Jacobsen-Tepfer, Esther. 1993. *The Deer-Goddess of Ancient Siberia: A Study in the Ecology of Belief*. Leiden: Brill.
- James, Simon. 1999. *The Atlantic Celts: Ancient People or Modern Invention?* London: British Musem Press.
- Janhunen, Juha. 2001. "Indo-Uralic and Ural-Altaic: On the diachronic implications of areal typology." In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolo, and Petteri Koskikallio, pp. 207–220. Mémoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- . 2000. Reconstructing Pre-Proto-Uralic typology: Spanning the millennia of linguistic evolution. In *Congressus Nonus Internationalis Fennno-Ugristarum*, pt. 1: *Orationes Plenariae & Orationes Publicae*, ed. Anu Nurk, Triinu Palo, and Tõnu Seilenthal, pp. 59–76. Tartu: CIFU.
- Jansen, Thomas, Peter Forster, Marsha A. Levine, Hardy Oelke, Matthew Hurles, Colin Renfrew, Jürgen Weber, and Klaus Olek. 2002. Mitochondrial DNA and the origins of the domestic horse. *Proceedings of the National Academy of Sciences* 99:10905–10910.
- Jarrige, Jean-Francois. 1994. The final phase of the Indus occupation at Nausharo and its connection with the following cultural complex of Mehrgarh VIII. *South Asian Archaeology* 1993 (1): 295–313.

- John, B. S. 1972. The linguistic significance of the Pembrokeshire Landsker. *The Pembrokeshire Historian* 4:7–29.
- Jones, Doug. 2003. Kinship and deep history: Exploring connections between culture areas, genes, and languages. *American Anthropologist* 105 (3): 501–514.
- Jones, Siân. 1997. *The Archaeology of Ethnicity: Constructing Identities in the Past and Present*. London: Routledge.
- Jones-Bley, Karlene. 2000. The Sintashta “chariots.” In *Kurgans, Ritual Sites, and Settlements: Eurasian Bronze and Iron Age*, ed. Jeannine Davis-Kimball, Eileen Murphy, Ludmila Koryakova, and Leonid Yablonsky, pp. 135–140. BAR International Series 89. Oxford: Archeopress.
- Jones-Bley, Karlene, and D. G. Zdanovich, eds. 2002. *Complex Societies of Central Eurasia from the 3rd to the 1st Millennium BC*. Vols. 1 and 2. Journal of Indo-European Studies Monograph 45. Washington, D.C.: Institute for the Study of Man.
- Jordan, Peter, and Stephen Shennan. 2003. Cultural transmission, language, and basketry traditions amongst the California Indians. *Journal of Anthropological Archaeology* 22:42–74.
- Jovanovich, B. 1975. Tumuli stepske culture grobova jama u Padunaylu,” *Starinar* 26:9–24.
- Kadyrbaev, M. K., and Z. Kurmankulov. 1992. *Kul'tura Drevnikh Skotobodov i Metallurgov Sary-Arki*. Alma-Ata: Gylym.
- Kalchev, Petar. 1996. Funeral rites of the Early Bronze Age flat necropolis near the Bereket tell, Stara Zagora.” In *Early Bronze Age Settlement Patterns in the Balkans*, pt. 2. Reports of Prehistoric Research Projects 1 (2–4): 215–225. Sofia: Agatho Publishers, Prehistory Foundation.
- Kallio, Petri. 2001. Phonetic Uralisms in Indo-European? In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolo, and Petteri Koskikallio, pp. 221–234. Memoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- Kasperavičiūtė, D., V. Kučinskas, and M. Stoneking. 2004. Y chromosome and mitochondrial DNA variation in Lithuanians. *Annals of Human Genetics* 68:438–452.
- Keeley, Lawrence, H. 1996. *War before Civilization*. New York: Oxford University Press.
- Keith, Kathryn. 1998. Spindle whorls, gender, and ethnicity at Late Chalcolithic Hacinebi Tepe. *Journal of Field Archaeology* 25:497–515.
- Kelley, Raymond C. 1985. *The Nuer Conquest*. Ann Arbor: University of Michigan Press.
- Kershaw, Kris. 2000. *The One-Eyed God: Odin and the Indo-Germanic Männerbünde*. Journal of Indo-European Studies Monograph 36. Washington, D.C.: Institute for the Study of Man.
- Khazanov, Anatoly. 1994 [1983]. *Nomads and the Outside World*. Rev. ed. Madison: University of Wisconsin Press.
- Kiguradze, Tamaž, and Antonio Sagona. 2003. On the origins of the Kura-Araxes cultural complex. In *Archaeology in the Borderlands*, ed. Adam T. Smith and Karen Rubinson, pp. 38–94. Los Angeles: Cotsen Institute.
- Kislenko, Aleksandr, and N. Tatarintseva. 1999. The eastern Ural steppe at the end of the Stone Age. In *Late Prehistoric Exploitation of the Eurasian Steppe*, ed. Marsha Levine, Yuri Rassamakin, A. Kislenko, and N. Tatarintseva, pp. 183–216. Cambridge: McDonald Institute for Archaeological Research.
- Kitson, Peter R. 1997. Reconstruction, typology, and the “original homeland” of the Indo-Europeans. In *Linguistic Reconstruction and Typology*, ed. Jacek Fisiak, pp. 183–239, esp. pp. 198–202. Berlin: Mouton de Gruyter.
- Kiyashko, V. Y. 1994. *Mezhdunarodnoe poselenie Razdorskoe i na Nizhnem Donu*. Kratkie soobschcheniya institutu arkheologii 192:73–79.
- Klejn, L. 1984. The coming of the Aryans: Who and whence? *Bulletin of the Deccan College Research Institute* 43:57–69.
- Klepikov, V. M. 1994. Pogrebeniya pozdneneoliticheskogo vremeni u Khutora Shlyakhovskii v nizhnem Povolzh'e. *Rossiskaya arkheologiya* (3): 97–102.

- Klochko, Viktor I., Aleksandr Koško, and Marzena Szmyt. 2003. A comparative chronology of the prehistory of the area between the Vistula and the Dnieper: 4000–1000 BC. *Baltic-Pontic Studies* 12:396–414.
- Knecht, Heidi, ed. 1997. *Projectile Technology*. New York: Plenum.
- Kniffen, F. B. 1986. Folk housing: Key to diffusion. In *Common Places: Readings in American Vernacular Architecture*, ed. Dell V. Upton and John M. Vlach, pp. 3–23. Athens: University of Georgia Press.
- Kohl, Philip, 2007. *The Making of Bronze Age Eurasia*. Cambridge: Cambridge University Press.
- Kohl, Philip L., and Gocha R. Tsetskhladze. 1995. Nationalism, politics, and the practice of archaeology in the Caucasus. In *Nationalism, Politics, and the Practice of Archaeology*, ed. Philip L. Kohl and Clare Fawcett, pp. 149–174. Cambridge: Cambridge University Press.
- Kohl, Philip L., Henri-Paul Francfort, and Jean-Claude Gardin. 1984. *Central Asia Palaeolithic Beginnings to the Iron Age*. Paris: Editions recherche sur les civilisations.
- Koivulehto, Jorma. 2001. The earliest contacts between Indo-European and Uralic speakers in the light of lexical loans. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolä, and Petteri Koskikallio, pp. 235–263. Memoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- Kolev, U. I., Kuznetsov, P. F., Kuz'mina, O. V., Semenova, A. P., Turetskii, M. A., and Aguzarov, B. A., eds. 2001. *Bronzovy Vek Vostochnoi Evropy: Kharakteristika Kul'tur, Khronologiya i Periodizatsiya*. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Kol'tsov, L. V., ed. 1989. *Mezolit SSSR*. Moscow: Nauka.
- Kopytoff, Igor. 1987. The internal African frontier: The making of African political culture. In *The African Frontier: The Reproduction of Traditional African Societies*, ed. Igor Kopytoff, pp. 3–84. Bloomington: Indiana University Press.
- Korenevskii, S. N. 1995. *Galiugai I, poselenie Maikopskoi kul'tury*. Moscow: Biblioteka rossiskogo etnografa.
- . 1993. *Drevneishee osedloe naselenie na sredнем Terekе*. Moscow: Stemi.
- . 1980. O metallicheskikh veshchakh i Utyevskogo mogil'nika. In *Arkeologiya Vostochno-Europeiskoi Lesostepi*, ed. A. D. Pryakhin, pp. 59–66. Voronezh: Vorenezhskogo universiteta.
- Korpusova, V. N., and S. N. Lyashko. 1990. Katakombnoe pogrebenie s pshenitsei v Krimu. *Sovetskaya Arkheologiya* 3:166–175.
- Korolev, A. I. 1999. Materialy po khronologii Eneolita pri Mokshan'ya. In *Voprosy Arkheologii Povolzh'ya, Sbornik Statei*, Vol. 1, ed. A. A. Vybornov and V. N. Myshkin, pp. 106–115. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Koryakova, L., and A. D. Epimakhov, 2007. *The Urals and Western Siberia in the Bronze and Iron Ages*. Cambridge: Cambridge University Press.
- Kosintsev, Pavel. 2001. Kompleks kostnykh ostatkov domashnikh zhivotnykh iz poselenii i mogil'nikov epokhi Bronzy Volgo-Ural'ya i ZaUral'ya. In *Bronzovy Vek Vostochnoi Evropy: Kharakteristika Kul'tur, Khronologiya i Periodizatsiya*, ed. Y. I. Kolev, pp. 363–367. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Koško, Aleksander, ed. 1999. *The Western Border Area of the Tripolye Culture*. Baltic-Pontic Studies 9. Poznań: Adam Mickiewicz University.
- Koško, Aleksandr, and Viktor I. Klochko, eds. 2003. *The Foundations of Radiocarbon Chronology of Cultures between the Vistula and Dnieper, 4000–1000 BC*. Baltic-Pontic Studies 12. Poznań: Adam Mickiewicz University.
- Kotova, Nadezhda, and L. A. Spitsyna. 2003. Radiocarbon chronology of the middle layer of the Mikhailivka settlement. *Baltic-Pontic Studies* 12:121–131.
- Kovaleva, I. F. 2001. "Vityanuty" pogrebeniya iz raskopok V. A. Gorodtsovykh kurganov Donetschiny v kontekste Postmariupol'skoi kul'tury. In *Bronzovy Vek v Vostochnoi Evropy: Kharakteristika Kul'tur', Khronologiya i Periodizatsiya*, ed. Y. U. Kolev, pp. 20–24. Samara: Samara gosudarstvennyi pedagogicheskii universitet.

- Kovaleva, V. T., and Zdanovich, G. B., eds. 2002. *Arkaim: Nekropol (po materialam kurgana 25 Bol'she Karaganskoe Mogil'nika)*. Chelyabinsk: Yuzhno-Ural'skoe knizhnoe izdatel'stvo.
- Kovapenko, G. T., and V. M. Fomenko. 1986. Pokhovannya dobi Eneolitu-ranni Bronzi na pravoberezhzhi Pivdennogo Bugu. *Arkeologiya* (Kiev) 55:10–25.
- Krahe, Hans. 1954. *Sprach und Vorzeit*. Heidelberg: Quelle und Meyer.
- Kremenetski, C. V. 2002. Steppe and forest-steppe belt of Eurasia: Holocene environmental history. In *Prehistoric Steppe Adaptation and the Horse*, ed. M. Levine, C. Renfrew, and K. Boyle, pp. 11–27. Cambridge: Cambridge University Press.
- . 1997a. Human impact on the Holocene vegetation of the South Russian plain. In *Landscapes in Flux: Central and Eastern Europe in Antiquity*, ed. John Chapman and Pavel Dolukhanov, pp. 275–287. London: Oxbow Books.
- . 1997b. The Late Holocene environment and climate shift in Russia and surrounding lands. In *Climate Change in the Third Millennium BC*, ed. H. Dalfes, G. Kukla, and H. Weiss, pp. 351–370. New York: Springer.
- Kremenetski, C. V., T. Böttger, F. W. Junge, A. G. Tarasov. 1999. Late- and postglacial environment of the Buzuluk area, middle Volga region, Russia. *Quaternary Science Reviews* 18:1185–1203.
- Kremenetski, C. V., O. A. Chichagova, and N. I. Shishlina. 1999. Palaeoecological evidence for Holocene vegetation, climate and land-use change in the low Don basin and Kalmuk area, southern Russia. *Vegetation History and Archaeology* 8 (4): 233–246.
- Kristiansen, Kristian, and Thomas Larsson. 2005. *The Rise of Bronze Age Society: Travels, Transmissions, and Transformations*. Cambridge: Cambridge University Press.
- Kriukova, E. A. 2003. Obraz loshadi v iskusstve stepnogo naseleniya epokhi Eneolita-Rannei Bronzy. In *Voprosy Arkeologii Povolzh'ya*, pp. 134–143. Samara: Samarskii nauchnyi tsentr RAN.
- Krizhevskaya, L. Y. 1991. *Nachalo Neolita v stepyah severnogo Priochernomor'ya*. St. Petersburg: Institut istorii material'noi kul'tury Akademii Nauk SSSR.
- Kruts, V. O. 1977. *Pozdnetripol'skie pamyatniki srednego Podneprov'ya*. Kiev: Naukovo Dumka.
- Kruts, V. O., and S. M. Rizhkov. 1985. Fazi rozvitiu pam'ятok Tomashiv's'ko-Syshkiv's'koj grupi. *Arkeologiya* (Kiev) 51:45–56.
- Kryvaltsevich, Mikola M., and Nikolai Kovalyukh. 1999. Radiocarbon dating of the Middle Dnieper culture from Belarus. *Baltic Pontic Studies* 7:151–162.
- Kubarev, V. D. 1988. *Drevnie rospisi Karakola*. Novosibirsk: Nauka.
- Kühl, Stefan. 1994. *The Nazi Connection: Eugenics, American Racism, and German National Socialism*. New York: Oxford University Press.
- Kuiper, F. B. J. 1991. *Aryans in the Rig-Veda*. Amsterdam: Rodopi.
- . 1960. The ancient Aryan verbal contest. *Indo-Iranian Journal* 4:217–281.
- . 1955. Rig Vedic Loanwords. *Studia Indologica* (Festschrift für Willibaldkirfel), pp. 137–185. Bonn: Selbst Verlag des Orientalischen Seminars des Universität.
- . 1948. *Proto-Munda Words in Sanskrit*. Amsterdam: Noord-Hollandische Uitgevers Maatschappij.
- Kulick, Don. 1992. *Language Shift and Cultural Reproduction: Socialization, Self, and Syncretism in a Papuan New Guinea Village*. Cambridge: Cambridge University Press.
- Kuna, Martin. 1991. The structuring of the prehistoric landscape. *Antiquity* 65:332–347.
- Kuzmina, I. E. 1988. Mlekopitatyushchie severnogo pri Kaspiya v Golotsene. *Arkeologicheskie Kul'tury Severnogo Prikaspiya*, ed. R. S. Bagautdinov, pp. 173–188. Kuibyshev: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Kuzmina, Elena E. 2003. Origins of pastoralism in the Eurasian steppes. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 203–232. Cambridge: McDonald Institute for Archaeological Research.
- . 2001. The first migration wave of Indo-Iranians to the south. *Journal of Indo-European Studies* 29 (1–2): 1–40.

- . 1994. *Otkuda prishli indoarii?* Moscow: MGP "Kalina" VINITI RAN.
- . 1980. Eshche raz o diskovidniykh psaliakh Evraziiskikh stepei. *Kratkie Soobshcheniya Institut Arkeologii* 161:8–21.
- Kuzmina, O. V. 1999. Keramika Abashevskoi kul'tury. In *Voprosy Arkeologii Povolzh'ya, Sbornik Statei*, vol. 1, ed. A. A. Vybornov and V. N. Myshkin, pp. 154–205. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Kuzminova, N. N. 1990. Paleoetnobotanicheskii i palinologicheskii analizy materialov iz kurganov nizhnego podnestrov'ya. In *Kurgany Eneolita-Eopkhi Bronzy Nizhnego Podnestrov'ya*, ed. E. V. Yarovoi, pp. 259–267. Kishinev: Shtiintsa.
- Kuzminova, N. N., V. A. Dergachev, and O. V. Larina. 1998. Paleoetnobotanicheskie issledovaniya na poselenii Sakarovka I. *Revista Arheologica* (Kishinev) (2): 166–182.
- Kuznetsov, Pavel. 2005. An Indo-European symbol of power in the earliest steppe kurgans. *Journal of Indo-European Studies* 33 (3–4): 325–338.
- . 2001. Territorial'nye osobennosti i vremennye ramki perekhodnogo perioda k epokhe Pozdnei Bronzy Vostochnoi Evropy. In *Bronzovy Vek Vostochnoi Evropy: Kharakteristika Kul'tur, Khronologiya i Periodizatsiya*, ed. Y. I. Kolev et al., pp. 71–82. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- . 1991. Unikalnoe pogrebenie epokhi rannei Bronzy na r. Kutuluk. In *Drevnosti Vostochno-Europeiskoi Lesostepi*, ed. V. V. Nikitin, pp. 137–139. Samara: Samarskii gosudarstvennyi pedagogicheskii institut. Labov, William. 1994. *Principles of Linguistic Change: Internal Factors*. Oxford: Blackwell.
- Lafontaine, Oskar, and Georgi Jordanov, eds. 1988. *Macht, Herrschaft und Gold: Das Gräberfeld von Varna (Bulgarien) und die Anfänge Einer Neuen Europäischen Zivilisation*. Saarbrücken: Moderne Galerie des Saarland-Museums.
- Lagodovskaya, E. F., O. G. Shaposhnikova, and M. L. Makarevich. 1959. Osnovnye itogi issledovaniya Mikhailovskogo poseleniya. *Kratkie soobshcheniya institut arkeologii* 9:21–28.
- Lakoff, George. 1987. *Women, Fire and Dangerous Things: What Categories Reveal about the Mind*. Chicago: University of Chicago Press.
- Lam, Andrew. 2006. *Learning a Language, Inventing a Future*. Commentary on National Public Radio, May 1, 2006.
- . 2005. *Perfume Dreams: Reflections on the Vietnamese Diaspora*. Foreword by Richard Rodriguez. Berkeley: Heyday Books.
- Lamberg-Karlovsky, C. C. 2002. Archaeology and language: The Indo-Iranians. *Current Anthropology* 43 (1): 63–88.
- Latacz, Joachim. 2004. *Troy and Homer: Toward a Solution of an Old Mystery*. Oxford: Oxford University Press.
- Lattimore, Owen. 1940. *Inner Asian Frontiers of China*. Boston: Beacon.
- Lavrushin, Y. A., E. A. Spiridonova, and L. L. Sulerzhitskii. 1998. Geologo-paleoekologocheskie sobytiya severa aridnoi zony v poslednie 10-tys. let. In *Problemy Drevnei Istorii Severnogo Prikaspiya*, ed. V. S. Gorbunov, pp. 40–65. Samara: Samarskogo gosudarstvennogo pedagogicheskogo universiteta.
- Leach, Edmund R. 1968. *Political Systems of Highland Burma*. Boston: Beacon.
- . 1960. The frontiers of Burma. *Comparative Studies in Society and History* 3 (1): 49–68.
- Lees, Robert. 1953. The basis of glottochronology. *Language* 29 (2): 113–127.
- Lefferts, H. L., Jr. 1977. Frontier demography: An introduction. In *The Frontier, Comparative Studies*, ed. D. H. Miller and J. O. Steffen, pp. 33–56. Norman: University of Oklahoma Press.
- Legge, Tony. 1996. The beginning of caprine domestication in southwest Asia. In *The Origins and Spread of Agriculture and Pastoralism in Eurasia*, ed. David R. Harris, pp. 238–262. London: University College London Press.
- Lehman, F. K. 1989. Internal inflationary pressures in the prestige economy of the Feast of Merit complex: The Chin and Kachin cases from upper Burma. In *Ritual, Power and Economy*:

- Upland-Lowland Contrasts in Mainland Southeast Asia*, ed. Susan D. Russell, pp. 89–101. Occasional Paper 14. DeKalb, Ill.: Center for Southeast Asian Studies.
- Lehmann, Winfred. 1989. Earlier stages of Proto-Indo-European. In *Indogermanica Europaea*, ed. K. Heller, O. Panagi, and J. Tischler, pp. 109–131. Grazer Linguistische Monographien 4. Graz: Institut für Sprachwissenschaft der Universität Graz.
- Lehrman, Alexander. 2001. Reconstructing Proto-Hittite. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 106–130. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- Leuschner, Hans Hubert, Ute Sass-Klaassen, Esther Jansma, Michael Baillie, and Marco Spurk. 2002. Subfossil European bog oaks: Population dynamics and long-term growth depressions as indicators of changes in the Holocene hydro-regime and climate. *The Holocene* 12 (6): 695–706.
- Levi, Scott C. 2002. *The Indian Diaspora in Central Asia and Its Trade, 1550–1900*. Leiden: Brill.
- Levine, Marsha. 2004. Exploring the criteria for early horse domestication. In *Traces of Ancestry: Studies in Honor of Colin Renfrew*, ed. Martin Jones, pp. 115–126. Cambridge: McDonald Institute for Archaeological Research.
- . 2003. Focusing on Central Eurasian archaeology: East meets west. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 1–7. Cambridge: McDonald Institute for Archaeological Research.
- . 1999a. Botai and the origins of horse domestication. *Journal of Anthropological Archaeology* 18:29–78.
- . 1999b. The origins of horse husbandry on the Eurasian steppe. In *Late Prehistoric Exploitation of the Eurasian Steppe*, ed. Marsha Levine, Yuri Rassamakin, Aleksandr Kislenko, and Nataliya Tatarintseva, pp. 5–58. Cambridge: McDonald Institute for Archaeological Research.
- . 1990. Dereivka and the problem of horse domestication. *Antiquity* 64:727–740.
- . 1982. The use of crown height measurements and eruption-wear sequences to age horse teeth. In *Ageing and Sexing Animal Bones from Archaeological Sites*, ed. B. Wilson, C. Grigson, and S. Payne, pp. 223–250. British Archaeological Reports, British Series 109. Oxford: Archaeopress.
- Levine, Marsha, and A. M. Kislenko. 2002. New Eneolithic and Early Bronze Age radiocarbon dates for northern Kazakhstan and south Siberia. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 131–134, Cambridge: McDonald Institute for Archaeological Research.
- Levine, Marsha, Colin Renfrew, and Katie Boyle, eds. 2003. *Prehistoric Steppe Adaptation and the Horse*. Cambridge: McDonald Institute for Archaeological Research.
- Li, Shuicheng. 2002. The interaction between northwest China and Central Asia during the second millennium BC: An archaeological perspective. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 171–182. Cambridge: McDonald Institute for Archaeological Research.
- Richardus, Jan, ed. 1991. *Die Kupferzeit als historische Epoche*. Bonn: Dr. Rudolf Hebel GMBH.
- Richardus, Jan, and Josef Vladar. 1996. Karpatenbecken-Sintashta-Mykene: ein Beitrag zur Definition der Bronzezeit als Historischer Epoche. *Slovenska Archeologia* 44 (1): 25–93.
- Lillie, Malcolm C. 1996. Mesolithic and Neolithic populations in Ukraine: Indications of diet from dental pathology. *Current Anthropology* 37 (1): 135–142.
- Lillie, Malcolm C., and M. P. Richards. 2000. Stable isotope analysis and dental evidence of diet at the Mesolithic-Neolithic transition in Ukraine. *Journal of Archaeological Science* 27:965–972.
- Lincoln, Bruce. 1981. *Priests, Warriors, and Cattle: A Study in the Ecology of Religions*. Berkeley: University of California Press.
- . 1991. *Death, War and Sacrifice: Studies in Ideology and Practice*. Chicago: University of Chicago Press.

- Lindgren, G., N. Backström, J. Swinburne, L. Hellborg, A. Einarsson, K. Sandberg, G. Cothran, Carles Vilà, M. Binns, and H. Ellegren. 2004. Limited number of patrilines in horse domestication. *Nature Genetics* 36 (3): 335–336.
- Lindstrom, Richard W. 2002. Anthropological characteristics of the population of the Bol'shekaragansky cemetery, kurgan 25. In *Arkaim: Nekropol' (po materialam kurgana 25 Bol'she Karaganskoe Mogil'nika)*, ed. V. T. Kovaleva and G.B. Zdanovich, pp. 159–166, Chelyabinsk: Yuzhno-Ural'skoe knizhnoc izdatel'stvo.
- Linduff, Katheryn M., Han Rubin, and Sun Shuyun, eds. 2000. *The Beginnings of Metallurgy in China*. New York: Edwin Mellen Press.
- Lisitsyn, N. F. 1996. Srednii etap pozdnego Paleolita Sibiri. *Rossiskaya arkheologiya* (4): 5–17.
- Littauer, Mary A. 1977. Rock carvings of chariots in Transcaucasia, Central Asia, and Outer Mongolia. *Proceedings of the Prehistoric Society* 43:243–262.
- . 1972. The military use of the chariot in the Aegean in the Late Bronze Age. *American Journal of Archaeology* 76:145–157.
- . 1968. A 19th and 20th dynasty heroic motif on Attic black-figured vases? *American Journal of Archaeology* 72:150–152.
- Littauer, Mary A., and Joost H. Crouwel. 1996. The origin of the true chariot. *Antiquity* 70:934–939.
- . 1986. A Near Eastern bridle bit of the second millennium BC in New York. *Levant* 18:163–167.
- . 1983. Chariots in Late Bronze Age Greece. *Antiquity* 57:187–192.
- . 1979. *Wheeled Vehicles and Ridden Animals in the Ancient Near East*. Leiden: Brill.
- Littleton, C. S. 1982. *The New Comparative Mythology*. Berkeley: University of California Press.
- Litvinsky, B. A., and L. T. P'yankova. 1992. Pastoral tribes of the Bronze Age in the Oxus valley (Bactria). In *History of the Civilizations of Central Asia*, ed. A. H. Dani and V. M. Masson, vol. 1, pp. 379–394. Paris: UNESCO.
- Logvin, V. N. 1995. K probleme stanovleniya Sintashtinsko-Petrovskikh drevnostei. In *Rossiya i Vostok: Problemy Vzaimodeistviya*, pt. 5, bk. 1: *Kul'tury Eneolita-Bronzy Stepnoi Evrazii*, pp. 88–95. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- . 1992. Poseleniya Tersekskogo tipa Solenoe Ozero I. *Rossiskaya arkheologiya* (1): 110–120.
- Logvin, V. N., S. S. Kalieva, and L. L. Gaiduchenko. 1989. O nomadizme v stepyakh Kazakhstana v III tys. do n. e. In *Margulanovskie chteniya*, pp. 78–81. Alma-Ata: Akademie Nauk Kazakhskoi SSR.
- Lubotsky, Alexander. 2001. The Indo-Iranian substratum. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolo, and Petteri Koskikallio, pp. 301–317. Helsinki: Suomalais-Ugrilainen Seura.
- Lukacs, J. R. 1989. Dental paleopathology: Methods for reconstructing dietary patterns. In *Reconstruction of Life From the Skeleton*, ed. M. Y. Iscan, and K. A. R. Kennedy, pp. 261–286. New York: Alan Liss.
- Lyashko, S. N., and V. V. Otroshchenko. 1988. Balkovskii kurgan. In *Novye pamyatniki yamnoi kul'tury stepnoi zony Ukrayiny*, ed. A. A. Zolotareva, pp. 40–63. Kiev: Naukovo Dumka.
- Lyonnnet, B., ed. 1996. *Sarazm (Tajikistan). Céramiques (Chalcolithiques et Bronze Ancien)*. Mémoire de la Mission Archéologique Française en Asie Centrale 7. Paris: De Boccard.
- Mace, Ruth. 1993. Transitions between cultivation and pastoralism in sub-Saharan Africa. *Current Anthropology* 34 (4): 363–382.
- MacEachern, Scott. 2000. Genes, tribes, and African history. *Current Anthropology* 41 (3): 357–384.
- Machnik, Jan. 1999. Radiocarbon chronology of the Corded Ware culture on Grzeda Sokalska: A Middle Dnieper traits perspective. *Baltic-Pontic Studies* 7:221–250.
- Madgearu, Alexandru. 2001. The end of town life in Scythia Minor. *Oxford Journal of Archaeology* 20 (2): 207–217.

- Makkay, Janos. 2000. *The Early Mycenaean Rulers and the Contemporary Early Iranians of the Northeast*. Tractata Miniscula 22. Budapest: szerzo kiadása.
- . 1976. Problems concerning Copper Age chronology in the Carpathian Basin: Copper Age gold pendants and gold discs in central and south-east Europe. *Acta Archaeologica Hungarica* 28:251–300.
- Malandra, William. 1983. *An Introduction to Ancient Iranian Religion*. Minneapolis: University of Minnesota Press.
- Maliutina, T. S. 1991. Stratigraficheskaya pozitsiya materilaov Fedorovskoi kul'tury na mnogo-sloinikh poseleniyakh Kazakhstanskikh stepei. In *Drevnosti Vostochno-Europeiskoi Lesostepi*, ed. V. V. Nikitin, pp. 141–162. Samara: Samarskii gosudarstvennyi pedagogicheskii institut.
- . 1984. Mogil'nik Priplodnyi Log 1. In *Bronzovy Vek Uralo-Irtyshskogo Mezhdurech'ya*, pp. 58–79. Chelyabinsk: Chelyabinskii gosudarstvennyi universitet.
- Maliutina, T. S., and G. B. Zdanovich. 1995. Kuisak—ukreplennoe poselenie protogorodskoi tsivilizatsii iuzhnogo zaUral'ya. In *Rossiya i Vostok: Problemy Vzaimodeistviya*, pt. 5, bk. 1: *Kul'tury Eneolita-Bronzy Stepnoi Evrazii*, pp. 100–106. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- Mallory, J. P. 1998. A European perspective on Indo-Europeans in Asia. In *The Bronze Age and Early Iron Age Peoples of Eastern Central Asia*, ed. Victor H. Mair, vol. 1, pp. 175–201. Philadelphia: University of Pennsylvania Press.
- . 1992. Migration and language change. *Peregrinatio Gothica III*, Universitetets Oldsaksamlings Skrifter Ny Rekke (Oslo) 14:145–153.
- . 1990. Social structure in the Pontic-Caspian Eneolithic: A preliminary review. *Journal of Indo-European Studies* 18 (1–2): 15–57.
- . 1989. *In Search of the Indo-Europeans*. London: Thames and Hudson.
- . 1977. The chronology of the early Kurgan tradition. *Journal of Indo-European Studies* 5:339–368.
- Mallory, J. P., and Douglas Q. Adams. 1997. *Encyclopedia of Indo-European Culture*. London: Fitzroy Dearborn.
- Mallory, J. P., and Victor H. Mair. 2000. *The Tarim Mummies: Ancient China and the Mystery of the Earliest Peoples from the West*. London: Thames and Hudson.
- Malov, N. M. 2002. Spears: Signs of archaic leaders of the Pokrovsk archaeological cultures. In *Complex Societies of Central Eurasia from the 3rd to the 1st Millennium BC*, vols. 1 and 2, ed. Karlene Jones-Bley and D. G. Zdanovich, pp. 314–336. Journal of Indo-European Studies Monograph 45. Washington, D.C.: Institute for the Study of Man.
- Mamonov, A. E. 1995. Elshanskii kompleks stoianki Chekalino IV. In *Drevnie kul'tury lesostepnogo povolzh'ya*, pp. 3–25. Samara: Samarskogo gosudarstvennogo pedagogicheskogo universiteta.
- Mamontov, V. I. 1974. Pozdneneoliticheskaya stoianka Orlovka. *Sovetskaya arkheologiya* (4): 254–258.
- Manfredi, J., Hilary M. Clayton, and D. Rosenstein. 2005. Radiographic study of bit position within the horse's oral cavity. *Equine and Comparative Exercise Physiology* 2 (3): 195–201.
- Manhart, H. 1998. Die vorgeschichtliche Tierwelt von Koprivec und Durankulak und anderen prähistorischen Fundplätzen in Bulgarien aufgrund von Knochenfunden aus archäologischen Ausgrabungen. *Documenta Naturae* (München) 116:1–353.
- Manzura, I. 1999. The Cernavoda I culture. In *The Balkans in Later Prehistory*, ed. Lolita Nikolova, pp. 95–174. British Archaeological Reports, International Series 791. Oxford: Archaeopress.
- Manzura, I., E. Savva, and L. Bogotaya. 1995. East-west interactions in the Eneolithic and Bronze Age cultures of the north-west Pontic region. *Journal of Indo-European Studies* 23 (1–2): 1–51.
- Maran, Joseph. 2001. Zur Westausbreitung von Boleráz-Elementen in Mitteleuropa. In *Cernavoda III-Boleráz, Ein vorgeschichtliches Phänomen zwischen dem Oberrhein und der unteren Donau*, ed. P. Roman, and S. Diamandi, pp. 733–752. Bucharest: Studia Danubiana.

- . 1998. *Kulturwandel auf dem Griechischen Festland und den Kykladen im späten 3. Jahrtausend v. Chr.* Bonn: Habelt.
- Marcik, Antónia. 1971. Data of the Copper Age anthropological find of Bárdos-Farmstead at Csongrád-Kettőshalom. *A Móra Ferenc Múzeum Évkönyve* (2): 19–27.
- Marinescu-Bilcu, S. 1981. Tirpești: From prehistory to history in Eastern Romania. *British Archaeological Reports, International Series* 107. Oxford: Archeopress.
- Marinescu-Bilcu, S., Alexandra Bolomey, Marin Cárciumáru, and Adrian Muraru. 1984. Ecological, economic and behavioral aspects of the Cucuteni A4 community at Dragușeni. *Dacia* 28 (1–2): 41–46.
- Marinescu-Bilcu, Silvia, M. Cárciumaru, and A. Muraru. 1981. Contributions to the ecology of pre- and proto-historic habitations at Tirpești. *Dacia* 25:7–31.
- Marinova, Elena. 2003. The new pollen core Lake Durankulak-3: The vegetation history and human impact in Northeastern Bulgaria. In *Aspects of Palynology and Paleontology*, ed. S. Tonkov, pp. 279–288. Sofia: Pensoft.
- Markevich, V. I. 1974. *Bugo-Dnestrovskaya kul'tura na territorii Moldavii*. Kishinev: Shintsa.
- . 1965. Issledovaniia Neolita na sredнем Dnestre. *Kratkie soobshcheniya institut arkeologii* 105:85–90.
- Markey, T. L. 1990. Gift, payment, and reward revisited. In *When Worlds Collide: The Indo-Europeans and the Pre-Indo-Europeans*, ed. T. L. Markey and John Grippin, pp. 345–362. Ann Arbor, Mich.: Karoma.
- Markovin, V. I. 1980. O nekotorykh voprosakh interpretatsii dol'mennykh i drugikh arkheologicheskikh pamyatnikov Kavkaza. *Kratkie soobshcheniya institut arkeologii* 161:36–45.
- Mashkour, Marjan. 2003. Equids in the northern part of the Iranian central plateau from the Neolithic to the Iron Age: New zoogeographic evidence. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 129–138. Cambridge: McDonald Institute for Archaeological Research.
- Masson, V. M. 1988. *Altyn-Depe*. Translated by Henry N. Michael. University Museum Monograph 55. Philadelphia: University of Pennsylvania Press.
- . 1979. Dinamika razvitiya Tripol'skogo obshchestva v svete paleo-demograficheskikh otsenok. In *Pervobytnaya Arkheologiya, Poiski i Nakhodki*, ed. N. N. Bondar and D. Y. Telegin, pp. 204–212. Kiev: Naukovo Dumka.
- Matiushchenko, V. I., and G. V. Sinitzyna. 1988. *Mogil'nik u d. Rostovka Vblizi Omska*. Tomsk: Tomskogo universiteta.
- Matiushin, G. N. 1986. The Mesolithic and Neolithic in the southern Urals and Central Asia. In *Hunters in Transition: Mesolithic Societies of Temperate Eurasia and Their Transition to Farming*, ed. M. Zvelebil, pp. 133–150. Cambridge: Cambridge University Press.
- Matthews, Roger, and Hassan Fazeli. 2004. Copper and complexity: Iran and Mesopotamia in the fourth millennium BC. *Iran* 42:61–75.
- McMahon, April, and Robert McMahon. 2003. Finding families: Quantitative methods in language classification. *Transactions of the Philological Society* 10:7–55.
- Meadow, Richard H., and Ajita Patel. 1997. A comment on "Horse Remains from Surkotada" by Sándor Bökonyi. *South Asian Studies* 13:308–315.
- Mei, Jianjun. 2003a. Cultural interaction between China and Central Asia during the Bronze Age. *Proceedings of the British Academy* 121:1–39.
- . 2003b. Qijia and Seima-Turbino: The question of early contacts between northwest China and the Eurasian steppe. *Bulletin of the Museum of Far Eastern Antiquities* 75: 31–54.
- Meid, Wolfgang. 1994. Die Terminologie von Pferd und Wagen im Indogermanischen. In *Die Indogermanen und das Pferd*, ed. B. Hänsel and S. Zimmer, pp. 53–65. Budapest: Archaeolingua.
- . 1975. Probleme der räumlichen und zeitlichen Gliederung des Indogermanischen. In *Flexion und Wortbildung*, ed. Helmut Rix, pp. 204–219. Weisbaden: Reichert.

- Melchert, Craig. 2001. Critical responses. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 229–235. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- . 1994. *Anatolian Historical Phonology*. Amsterdam: Rodopi.
- Melent'ev, A. N. 1975. Pamyatniki seroglazivskoi kul'tury (neolit Severnogo Prikasiya). *Kratkie soobshcheniya institut arkeologii* (Moscow) 141:112–118.
- Mel'nik, A. A., and I. L. Serdiukova. 1988. Rekonstruktsiya pogrebal'noi povozi Yamnoi kul'tury. In *Novye pamyatniki yamnoi kul'tury stepnoi zony Ukrayny*, ed. N. N. Bondar and D. Y. Telegin, pp. 118–124. Kiev: Dumka.
- Merpert, N. Y. 1995. Bulgaro-Russian archaeological investigations in the Balkans. *Ancient Civilizations from Scythia to Siberia* 2 (3): 364–383.
- . 1980. Rannie skotovody vostochnoi Evropy i sudby drevneishikh tsivilizatsii. *Studia Praehistorica* 3:65–90.
- . 1974. *Drevneishie Skotovody Volzhsko-Uralskogo Mezhdurechya*. Moscow: Nauka.
- Mezhlumian, S. K. 1990. Domestic horse in Armenia. Paper delivered at the International Conference on Archaeozoology, Washington, D.C.
- Milisauskas, Sarunas. 2002. *European Prehistory: A Survey*. New York: Kluwer.
- Militarev, Alexander. 2002. The prehistory of a dispersal: The Proto-Afroasiatic (Afroasiatic) farming lexicon. In *Examining the Farming/Language Dispersal Hypothesis*, ed. Peter Bellwood and Colin Renfrew, pp. 135–150. Cambridge: McDonald Institute for Archaeological Research.
- Milroy, James. 1992. *Linguistic Variation and Change*. Oxford: Blackwell.
- Molleson, Theya, and Joel Blondiaux. 1994. Riders' bones from Kish, Iraq. *Cambridge Archaeological Journal* 4 (2): 312–316.
- Molodin, V. I. 1997. Nekotoriye itogi arkheologicheskikh issledovanii na Iuge Gornogo Altaya. *Rossiiskaya arkheologiya* (1): 37–49.
- Moore, John. 2001. Ethnogenetic patterns in Native North America. In *Archaeology, Language, and History*, ed. John E. Terrell, pp. 31–56. Westport, Conn.: Bergin and Garvey.
- Moorey, P. R. S. 1986. The emergence of the light, horse-drawn chariot in the Near East, c. 2000–1500 BC. *World Archaeology* 18 (2): 196–215.
- Morganova, N. L. 1995. Elitnye kurgany eopkhii rannei I srednei bronzy v stepnom Orenburzh'e. In *Rossiya i Vostok: Problemy Vzaimodeistviya*, pt. 5, bk. 1, *Kul'tury Eneolita-Bronzy Stepnoi Evrazii*, pp. 120–123. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- . 1988. Ivanovskaya stoianka v Orenburgskoi oblasti. In *Arkheologicheskie kul'tury severnogo prikasiya*, ed. R. S. Bagautdinov, pp. 106–122. Kuibyshev: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Morganova, N. L., and M. A. Turetskii. 2003. Yamnye pamyatniki u s. Shumaev: novye dannye o kolesnom transporte u naseleniya zapadnogo Orenburzh'ya v epokha rannego metalla. In *Voprosy arkheologii povozb'yia*, vol. 3, pp. 144–159. Samara: Samarskii nauchnyi tsentr RAN.
- Morintz, Sebastian, and Petre Roman. 1968. Aspekte des Ausgangs des Äneolithikums und der Übergangsstufe zur Bronzezeit im Raum der Niederdonau. *Dacia* 12:45–128.
- Movsha, T. G. 1985. Bzaemovidnosini Tripillya-Kukuteni z sinkhronimi kul'turami Tsentral'noi Evropi. *Arkheologiya* (Kiev) 51:22–31.
- Mufwene, Salikoko. 2001. *The Ecology of Language Evolution*. Cambridge: Cambridge University Press.
- Muhly, J. D. 1995. Mining and Metalwork in Ancient Western Asia. In *Civilizations of the Ancient Near East*, ed. Jack M. Sasson, John Baines, Gary Beckman, and Karen R. Rubinson, vol. 3, pp. 1501–1519. New York: Scribner's.
- Munchaev, R. M. 1994. Maikopskaya kul'tura. In *Epokha Bronzy Kavkaza i Srednei Azii: Ranneya i Srednyaya Bronza Kavkaza*, ed. K. X. Kushnareva and V. I. Markovin, pp. 158–225. Moscow: Nauka.

- . 1982. Voprosy khozyaistva i obshchestvennogo stroya Eneoliticheskikh plemen Kavkaza. In *Eneolit SSSR*, ed. V. M. Masson and N. Y. Merpert, pp. 132–137. Moscow: Akademiya nauk.
- Murphy, Eileen. 2003. *Iron Age Archaeology and Trauma from Aymyrlyg, South Siberia*. British Archaeological Reports International Series 1152. Oxford: Archeopress.
- Murphy, Eileen, and Aleksandr Kokhlov. 2004. Osteological and paleopathological analysis of Volga populations from the Eneolithic to the Srubnaya periods. Samara Valley Project Interim Reports, private manuscript.
- Muscarella, Oscar W. 2003. The chronology and culture of Se Girdan: Phase III. *Ancient Civilizations* 9 (1–2): 117–131.
- Mytum, Harold. 1994. Language as symbol in churchyard monuments: the use of Welsh in nineteenth and twentieth-century Pembrokeshire. *World Archaeology* 26 (2): 252–267.
- Napol'skikh, V. V. 1997. *Vvedenie v Istoricheskuiu Uralistiku*. Izhevsk: Udmurtskii institut istorii, yazika i literatury.
- Nash, Gary. 1984. Social development. In *Colonial British America*, ed. Jack P. Green and J. R. Pole, pp. 233–261. Baltimore, Md.: Johns Hopkins University Press.
- Nechitailo, A. P. 1996. Evropeiskaya stepnaya obshchnost' v epokhu Eneolita. *Rossiiskaya arkheologiya* (4): 18–30.
- . 1991. *Seyazi naseleniya stepnoi Ukrayiny i severnogo Kavkaza v epokhy Bronzy*. Kiev: Naukovo Dumka.
- Necrasov, Olga. 1985. Doneés anthropologiques concernant la population du complexe culturel Cucuteni-Ariuşd-Tripolié: Phases Cucuteni et Ariuşd. *Annuaire Roumain D'Anthropologie (Bucarest)* 22:17–23.
- Necrasov, Olga, and M. Cristescu. 1973. Structure anthropologique des tribus Neo-Eneolithiques et de l'age du Bronze de la Roumanie. In *Die Anfänge des Neolithikums vom Orient bis Nordeuropa VIIIa, Fundamenta*, vol. 3, pp. 137–152. Cologne: Institut für Ur-und Frügeschichte der Universität zu Köln.
- Nefedkin, A. K. and E. D. Frolov. 2001. *Boevye kolesnitsy i kolesnicie drevnikh Grekov (XVI–I vv. do n.e.)*. St. Petersburg: Peterburgskoe Vostokovedenie.
- Nekhaev, A. A. 1992. Domakiopskaya kul'tura severnogo Kavkaza. *Arkheologicheskie vesti* 1:76–96.
- . 1986. Pogrebenie Maikopskoi kul'tury iz kurgana u s. Krasnogvardeiskoe. *Sovietskaya arkheologiya* (1): 244–248.
- Neprina, V. I. 1970. Neolitichne poselenniya v Girli r. Gniliop'yati. *Arkheologiya* (Kiev) 24:100–111.
- Nettles, Daniel. 1996. Language diversity in West Africa: An ecological approach. *Journal of Anthropological Archaeology* 15:403–438.
- Neustupny, E. 1991. Community areas of prehistoric farmers in Bohemia. *Antiquity* 65:326–331.
- Nica, Marin. 1977. Circea, cea mai veche aşezare neolitică de la sud de carpați. *Studii si Cercetări de Istorie Veche și Arheologie* 27 (4): 4, 435–463.
- Nichols, Johanna. 1997a. The epicentre of the Indo-European linguistic spread. In *Archaeology and Language, I vol. 1, Theoretical and Methodological Orientations*, ed. Roger Blench, and Matthew Spriggs, pp. 122–148. London: Routledge.
- . 1997b. Modeling ancient population structures and movement in linguistics. *Annual Review of Anthropology* 26:359–384.
- . 1994. The spread of languages around the Pacific rim. *Evolutionary Anthropology* 3:206–215.
- . 1992. *Linguistic Diversity in Space and Time*. Chicago: University of Chicago Press.
- Nikolova, A. V., and Y. Y. Rassamakin. 1985. O pozdneeneoliticheskikh pamyatnikakh pravoberezh'ya Dnepra. *Sovietskaya arkheologiya* (3):37–56.
- Nikolova, Lolita. 2005. Social changes and cultural interactions in later Balkan prehistory (later fifth and fourth millennia calBC). *Reports of Prehistoric Research Projects* 6–7:87–96. Salt Lake City, Utah: International Institute of Anthropology.

- . 2002. Diversity of prehistoric burial customs. In *Material Evidence and Cultural Pattern in Prehistory*, ed. L. Nikolova, pp. 53–87. Salt Lake City: International Institute of Anthropology.
- . 2000. Social transformations and evolution in the Balkans in the fourth and third millennia BC. In *Analyzing the Bronze Age*, ed. L. Nikolova, pp. 1–8. Sofia: Prehistory Foundation.
- . 1996. Settlements and ceramics: The experience of Early Bronze Age in Bulgaria. In *Early Bronze Age Settlement Patterns in the Balkans*, pt. 2, ed. Lolita Nikolova, pp. 145–186. Sofia: Reports of Prehistoric Research Projects 1 (2–4).
- . 1994. On the Pit-Grave culture in northeastern Bulgaria. *Helis* (Sofia) 3:27–42.
- Nobis, G. 1971. *Vom Wildpferd zum Hauspferd*. Fundamenta Reihe B, vol. 6. Cologne: Bohlau-Verlag.
- Noble, Allen G. 1992. Migration to North America: Before, during, and after the nineteenth century. In *To Build in a New Land: Ethnic Landscapes in North America*, ed. Allen G. Noble, pp. 3–24. Baltimore, Md.: Johns Hopkins University Press.
- Noelle, Christine. 1997. *State and Tribe in Nineteenth-Century Afghanistan: The reign of Amir Dost Muhammad Khan (1826–1863)*. Richmond, Surrey: Curzon.
- Oates, Joan. 2003. A note on the early evidence for horse and the riding of equids in Western Asia. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 115–125. Cambridge: McDonald Institute for Archaeological Research.
- . 2001. Equid figurines and “chariot” models. In *Excavations at Tell Brak*, ed. David Oates, Joan Oates, and Helen McDonald, vol. 2, pp. 279–293. Cambridge: McDonald Institute for Archaeological Research.
- O'Brien, S. R., P. A. Mayewski, L. D. Meeker, D. A. Meese, M. S. Twickler, and S. I. Whitlow. 1995. Complexity of Holocene climate as reconstructed from a Greenland ice core. *Science* 270:1962–1964.
- O'Flaherty, Wendy Doniger. 1981. *The Rig Veda: An Anthology*. London: Penguin.
- Olsen, Sandra. 2003. The exploitation of horses at Botai, Kazakhstan. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 83–104. Cambridge: McDonald Institute for Archaeological Research.
- Okhrimenko, G. V., and D. Y. Telegin. 1982. Novi pam'yatki mezolitu ta neolitu Volini. *Arkheologiya* (Kiev) 39:64–77.
- Ostroshchenko, V. V. 2003. The economic peculiarities of the Srubnaya cultural-historical entity. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 319–328. Cambridge: McDonald Institute for Archaeological Research.
- Ostroverkhov, A. S. 1985. Steklyannye busy v pamyatnikakh pozdnego Tripolya. In *Novye materialy po arkheologii severo-zapadnogo prichernomorya*, ed. V. N. Stanko, pp. 174–180. Kiev: Naukovo Dumka.
- Ottaway, Barbara S., ed. 1999. *A Changing Place: The Galgenberg in Lower Bavaria from the Fifth to the First Millennium BC*. British Archaeological Reports, n.s. 752. Oxford: Archaeopress.
- Owen, David I. 1991. The first equestrian: An UrIII glyptic scene. *Acta Sumerologica* 13:259–273.
- Özbal, H., A. Adriaens, and B. Earl. 2000. Hacinebi metal production and exchange. *Paleorient* 25 (1): 57–65.
- Panayotov, Ivan. 1989. *Yamnata Kultuya v B'lgarskite Zemi*. Vol. 21. Sofia: Razkopki i Prouchniya.
- Parker, Bradley. 2006. Toward an understanding of borderland processes. *American Antiquity* 71 (1): 77–100.
- Parpola, Asko. 2004–2005. The Nāsatyas, the chariot, and Proto-Aryan religion. *Journal of Indological Studies* 16, 17:1–63.
- . 2002. From the dialects of Old Indo-Aryan to Proto-Indo-Aryan and Proto-Iranian. In *Indo-Iranian Languages and Peoples*, ed. N. Sims-Williams, pp. 43–102. London: Oxford University Press.

- . 1988. The coming of the Aryans to Iran and India and the cultural and ethnic identity of the Dásas. *Studia Orientalia* (Helsinki) 64:195–302.
- Parzinger, H. 2002. Germanskii Arkheologicheskii Institut: zadachi i perspektivy arkheologicheskogo izucheniya Evrazii. *Rossiiskaya arkheologiya* (3): 59–78.
- . 1993. *Studien zur Chronologie und Kulturgegeschichte der Jungstein-, Kupfer- und Frühbronzezeit Zwischen Karpaten und Mittelerem Taurus*. Mainz am Rhein: Römisches-Germanische Forschungen B 52.
- . 1992. Hornstaad-Hlinskoe-Stollhof: Zur absoluten datierung eines vor-Badenzeitlichen Horizontes. *Germania* 70:241–250.
- Parzinger, Hermann, and Nikolaus Boroffka. 2003. *Das Zinn der Bronzezeit in Mittelasien*. Vol. 1, *Die siedlungsarchäologischen Forschungen im Umfeld der Zinnlagerstätten*. Archäologie in Iran und Turan, Band 5. Mainz am Rhein: Philipp von Zabern.
- Pashkevich, G. O. 2003. Paleoethnobotanical evidence of agriculture in the steppe and the forest-steppe of east Europe in the late Neolithic and the Bronze Age. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, Colin Renfrew, and Katie Boyle, pp. 287–297. Cambridge: McDonald Institute for Archaeological Research.
- . 1992. Do rekonstruktii asortimentu kul'turnikh roslin epokhi Neolitu-Bronzi na territorii Ukrainskoi. In *Starodavne Vibornistvo na Territorii Ukrainskoi*, ed. S. V. Pan'kov and G. O. Voznesens'ka, pp. 179–194. Kiev: Naukova Dumka.
- Patovka, E. F. 1976. Usatovo: iz istorii issledovaniya. *Materiali i issledovaniya po arkheologii severnogo prichernomoriya* (Kiev) 8:49–60.
- Patovka, E. F., et al. 1989. *Pamyatniki tripol'skoi kul'tury v severo-zapadnom prichernomor'ye*. Kiev: Naukova Dumka.
- Payne, Sebastian. 1995. Appendix B. In *The Gordian Excavations (1950–1973) Final Reports*, vol. 2, pt. 1, *The Lesser Phrygian Tumuli: The Inhumations*, ed. Ellen L. Kohler. Philadelphia: University Museum Press.
- Paunescu, Alexandru. 1987. Tardenoasianul din Dobrogea. *Studii și Cercetări de Istorie Veche și Arheologie* 38 (1): 3–22.
- Penner, Sylvia. *Schliemanns Schachtgräber und der Europäische Nordosten: Studien zur Herkunft der frühmykenischen Streitwagenausstattung*. Vol. 60. Bonn: Saarbrücker Beiträge zur Altertumskunde.
- Penny, Ralph. 2000. *Variation and Change in Spanish*. Cambridge: Cambridge University Press.
- Perles, Catherine. 2001. *Early Neolithic Greece*. Cambridge: Cambridge University Press.
- Pernicka, Ernst, et al. 1997. Prehistoric copper in Bulgaria. *Eurasia Antiqua* 3:41–179.
- Perry, C. A., and K. J. Hsu. 2000. Geophysical, archaeological, and historical evidence support a solar-output model for climate change. *Proceedings of the National Academy of Sciences* 7 (23): 12,433–12,438.
- Peške, Lubomir. 1986. Domesticated horses in the Lengyel culture? In *Internationales Symposium Über die Lengyel-Kultur*, pp. 221–226. Nitra-Wien: Archäologisches Institut der Slowakischen Akademie der Wissenschaften in Nitra.
- Peterson, Nicholas. 1993. Demand sharing: Reciprocity and the pressure for generosity among foragers. *American Anthropologist* 95 (4): 860–874.
- Petrenko, A. G. 1984. *Drevnee i srednevekovoe zhivotnovodstvo srednego povolzh'ya i predural'ya*. Moscow: Nauka.
- Piggott, Stuart. 1992. *Wagon, Chariot and Carriage: Symbol and Status in the History of Transport*. London: Thames and Hudson.
- . 1983. *The Earliest Wheeled Transport: From the Atlantic Coast to the Caspian Sea*. New York: Cornell University Press.
- . 1974. Chariots in the Caucasus and China. *Antiquity* 48:16–24.
- . 1962. Heads and hoofs. *Antiquity* 36 (142): 110–118.
- Pinker, Steven. 1994. *The Language Instinct*. New York: William Morrow.

- Pogozheva, A. P. 1983. *Antropomorfnaia Plastika Tripol'ya*. Novosibirsk: Akademiiia nauk, Sibirske otstelenie.
- Poliakov, Leon. 1974. *The Aryan Myth: A History of Racist and Nationalist Ideas in Europe*. Translated by Edmund Howard. New York: Basic Books.
- Pollack, Susan. 1999. *Ancient Mesopotamia*. Cambridge: Cambridge University Press.
- Polomé, Edgar C. 1991. Indo-European religion and the Indo-European religious vocabulary. In *Sprung from Some Common Source: Investigations into the Prehistory of Languages*, ed. S. M. Lamb and E. D. Mitchell, pp. 67–88. Stanford: Stanford University Press.
- . 1990. Types of linguistic evidence for early contact: Indo-Europeans and non-Indo-Europeans. In *When Worlds Collide: Indo-Europeans and the Pre-Indo-Europeans*, ed. T. L. Markey, and John A. C. Greppin, pp. 267–289. Ann Arbor, Mich.: Karoma.
- Popova, T. A. 1979. Kremneobratyvaiushchee proizvodstvo Tripol'skikh plemen. In *Pervobytnaya Arkheologiya, Poiski i Nakhodki*, ed. N. N. Bondar and D. Y. Telegin, pp. 145–163. Kiev: Naukovo Dumka.
- Porter, John. 1965. *The Vertical Mosaic: An Analysis of Social Class and Power in Canada*. Toronto: University of Toronto Press.
- Potekhina, I. D. 1999. *Naselenie Ukrayiny v Epokhi Neolita i Rannego Eneolita*. Kiev: Institut arkheologii.
- Potts, Dan T. 2000. *Ancient Magan: The Secrets of Tell Abrag*. London: Trident.
- . 1999. *The Archaeology of Elam*. Cambridge: Cambridge University Press.
- Prescott, J. R. V. 1987. *Political Frontiers and Boundaries*. London: Unwin Hyman.
- Privat, Karen. 2002. Preliminary report of paleodietary analysis of human and faunal remains from Bolshekaragansky kurgan 25. In *Arkaim: Nekropol (po materialam kurgana 25 Bol'she Karaganskoe Mogil'nika)*, ed. V. T. Kovaleva, and G. B. Zdanovich, pp. 166–171. Chelyabinsk: Yuzhno-Ural'skoe knizhnoe izdatel'stvo.
- Pryakhin, A. D., 1980. Abashevskaya kul'turno-istoricheskaya obshchnost' epokhi bronzy i lesostope. In *Arkheologiya Vostochno-Europeiskoi Lesostepi*, ed. A. D. Pryakhin, pp. 7–32. Voronezh: Voronezhskogo universiteta.
- . 1976. *Poseleniya Abashevskoi Obshchnosti*. Voronezh: Voronezhskogo universiteta.
- Pryakhin, A. D., and V. I. Besedin. 1999. The horse bridle of the Middle Bronze Age in the East European forest-steppe and the steppe. *Anthropology and Archaeology of Eurasia* 38 (1): 39–59.
- Puhvel, Jaan. 1994. Anatolian: Autochthonous or interloper? *Journal of Indo-European Studies* 22:251–263.
- . 1991. Whence the Hittite, whither the Jonesian vision? In *Sprung from Some Common Source*, ed. Sydney M. Lamb and E. D. Mitchell, pp. 52–66. Stanford: Stanford University Press.
- . 1975. Remus et Frater. *History of Religions* 15:146–157.
- Pulgram, E. 1959. Proto-Indo-European reality and reconstruction. *Language* 35:421–426.
- Rassamakin, Yuri. 2002. Aspects of Pontic steppe development (4550–3000 BC) in the light of the new cultural-chronological model. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 49–74. Cambridge: McDonald Institute for Archaeological Research.
- . 1999. The Eneolithic of the Black Sea steppe: dynamics of cultural and economic development, 4500–2300 BC. In *Late Prehistoric Exploitation of the Eurasian Steppe*, ed. Marsha Levine, Yuri Rassamakin, Aleksandr Kislenko, and Nataliya Tatarintseva, pp. 59–182. Cambridge: McDonald Institute for Archaeological Research.
- Raulwing, Peter. 2000. *Horses, Chariots and Indo-Europeans*. Archaeolingua Series Minor 13. Budapest: Archaeolingua Foundation.
- Reade, Julian. 2001. Assyrian king-lists, the royal tombs of Ur, and Indus Origins. *Journal of Near Eastern Studies* 60 (1): 1–29.

- Renfrew, Colin. 2002a. Pastoralism and interaction: Some introductory questions. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 1–12. Cambridge: McDonald Institute for Archaeological Research.
- . 2002b. The emerging synthesis: The archaeogenetics of farming/language dispersals and other spread zones. In *Examining the Farming/Language Dispersal Hypothesis*, ed. Peter Bellwood and Colin Renfrew, pp. 3–16. Cambridge: McDonald Institute for Archaeological Research.
- . 2001. The Anatolian origins of Proto-Indo-European and the autochthony of the Hittites. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 36–63. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- . 2000. At the edge of knowability: Towards a prehistory of languages. *Cambridge Archaeological Journal* 10 (1): 7–34.
- . 1998. Word of Minos: The Minoan contribution to Mycenaean Greek and the linguistic geography of the Bronze Age Aegean. *Cambridge Archaeological Journal* 8 (2): 239–264.
- . 1996. Language families and the spread of farming. In *The Origins and Spread of Agriculture and Pastoralism in Eurasia*, ed. David Harris, pp. 70–92. Washington, D.C.: Smithsonian Institution Press.
- . 1987. *Archaeology and Language: The Puzzle of Indo-European Origins*. London: Jonathon Cape.
- . 1973. *Before Civilization: The Radiocarbon Revolution and Prehistoric Europe*. London: Jonathon Cape.
- Renfrew, Colin, April McMahon, and Larry Trask, eds. 2000. *Time Depth in Historical Linguistics*. Cambridge: McDonald Institute for Archaeological Research.
- Rexová, Katerina, Daniel Frynta, and Jan Zrzavý. 2003. Cladistic analysis of languages: Indo-European classification based on lexicostatistical data. *Cladistics* 19 (2): 120–127.
- Rezepkin, A. D. 2000. *Das Frühbronzezeitliche Gräberfeld von Klady und die Majkop-Kultur in Nordwestkaukasien*. Archäologie in Eurasien 10. Rahden: Verlag Marie Leidorf.
- . 1991. Kurgan 31 mogil'nika Klady problemy genezisa i khronologii Maikopskoi kul'tury. In *Drevnie kul'tury prikuban'ya*, ed. V. M. Masson, pp. 167–197. Leningrad: Nauka.
- Rezepkin, A. D. and A. V. Kondrashov. 1988. Novosvobodnenskoe pogrebenie s povozkoy. *Kratkie soobshcheniya instituta arkeologii AN SSSR* 193:91–97.
- Richter, Daniel K. 1992. *The Ordeal of the Longhouse: The Peoples of the Iroquois League in the Era of European Colonization*. Chapel Hill: University of North Carolina Press.
- Rijksbaron, A. 1988. The discourse function of the imperfect. In *In the Footsteps of Raphael Kühner*, ed. A. Rijksbaron, H. A. Mulder, and G. C. Wakker, pp. 237–254. Amsterdam: J. C. Geibens.
- Ringe, Don. 1997. A probabilistic evaluation of Indo-Uralic. In *Nostratic: Sifting the Evidence*, ed. B. Joseph and J. Salmons, pp. 153–197. Philadelphia: Benjamins.
- Ringe, Don, Tandy Warnow, and Ann Taylor. 2002. Indo-European and computational cladistics. *Transactions of the Philological Society* 100:59–129.
- Ringe, Don, Tandy Warnow, Ann Taylor, A. Michailov, and Libby Levison. 1998. Computational cladistics and the position of Tocharian. In *The Bronze Age and Early Iron Age Peoples of Eastern Central Asia*, ed. Victor Mair, pp. 391–414. Washington, D.C.: Institute for the Study of Man.
- Robb, J. 1993. A social prehistory of European languages. *Antiquity* 67:747–760.
- . 1991. Random causes with directed effects: The Indo-European language spread and the stochastic loss of lineages. *Antiquity* 65:287–291.
- Roman, Petre. 1978. Modificări în tabelul sincronismelor privind eneoliticul Tirziu. *Studii și Cercetări de Istorie Veche și Arheologie* (Bucharest) 29 (2): 215–221.
- Rosenberg, Michael. 1998. Cheating at musical chairs: Territoriality and sedentism in an evolutionary context. *Current Anthropology* 39 (5): 653–681.

- . 1994. Agricultural origins in the American Midwest: A reply to Charles. *American Anthropologist* 96 (1): 161–164.
- Rostovtseff, M. 1922. *Iranians and Greeks in South Russia*. Oxford: Clarendon.
- Rothman, Mitchell S. 2003. Ripples in the stream: Transcaucasia-Anatolian interaction in the Murat/Euphrates basin at the beginning of the third millennium BC. In *Archaeology in the Borderlands*, ed. Adam T. Smith and Karen Rubinson, pp. 95–110. Los Angeles: Cotsen Institute.
- . 2001. *Uruk Mesopotamia and Its Neighbors: Cross-cultural Interactions in the Era of State Formation*. Santa Fe: SAR.
- Russell, Josiah Cox. 1972. *Medieval Regions and Their Cities*. Bloomington: Indiana University Press.
- Rutter, Jeremy. 1993. Review of Aegean prehistory II: The prepalatial Bronze Age of the southern and central Greek mainland. *American Journal of Archaeology* 97:745–797.
- Ryden, Hope. 1978. *America's Last Wild Horses*. New York: Dutton.
- Ryder, Tom. 1987. Questions and Answers. *The Carriage Journal* 24 (4): 200–201.
- Ryndina, N. V. 1998. *Dreneishee Metallo-obrabatyayushchee Proizvodstvo Iugo-Vostochnoi Evropy*. Moscow: Editorial.
- Ryndina, N. V. and A. V. Engovatova. 1990. Opty planigraficheskogo analiza kremnevyykh orudii Tripol'skogo poseleniya Drutsy 1. In *Rannezemel'dcheskie Poseleniya-Giganty Tripol'skoi Kul'tury na Ukraine*, ed. I. T. Chernyakov, pp. 108–114. Tal'yanki: Institut arkheologii akademii nauk USSR.
- Salminen, Tapani. 2001. The rise of the Finno-Ugric language family. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolo, and Petteri Koskikallio, pp. 385–395. Memoires de la Société Finno-Ugrienne 242. Helsinki: Suomalais-Ugrilainen Seura.
- Salmons, Joe. 1993. *The Glottalic Theory: Survey and Synthesis*. Journal of Indo-European Studies Monograph 10. Washington, D.C.: Institute for the Study of Man.
- Salvatori, Sandro. 2003. Pots and peoples: The “Pandora’s Jar” of Central Asian archaeological research: On two recent books on Gonur graveyard excavations. *Rivista di Archeologia* 27:5–20.
- . 2002. Project “Archaeological map of the Murghab Delta” (Turkmenistan): Test trenches at the sites of Adzhi Kui 1 and 9. *Ancient Civilizations from Scythia to Siberia* 8 (1–2): 107–178.
- . 2000. Bactria and Margiana seals: A new assessment of their chronological position and a typological survey. *East and West* 50 (1–4): 97–145.
- Salvatori, Sandro, Massimo Vidale, Giuseppe Guida, and Giovanni Gigante. 2002. A glimpse on copper and lead metalworking at Altyn-Depe (Turkmenistan) in the 3rd millennium BC. *Ancient Civilizations from Scythia to Siberia* 8:69–101.
- Samashev, Z. 1993. *Petroglyphs of the East Kazakhstan as a Historical Source*. Almaty: Rakurs.
- Sapir, Edward. 1912. Language and environment. *American Anthropologist* 14(2): 226–42.
- Sarianidi, V. I. 2002. *Margush: Drevnevostochnoe tsarstvo v staroi del'te reki Murgab*. Ashgabat: Turkmenkölethebarly.
- . 1995. New discoveries at ancient Gonur. *Ancient Civilizations from Scythia to Siberia* 2 (3): 289–310.
- . 1987. Southwest Asia: Migrations, the Aryans, and Zoroastrians. *Information Bulletin, International Association for the Study of the Cultures of Central Asia* (Moscow) 13:44–56.
- . 1986. Mesopotamia i Baktria vo ii tys. do n.e. *Sovetskaja Arkheologija* (2): 34–46.
- . 1977. *Drevnie Zemledel'tsy Afganistana: Materialy Sovetsko-Afganskoi Ekspeditsii 1969–1974 gg.* Moscow: Akademii Nauka.
- Sawyer, Ralph D. 1993. *The Seven Military Classics of Ancient China*. Boulder, Colo.: Westview.
- Schlegel, Alice. 1992. African political models in the American Southwest: Hopi as an internal frontier society. *American Anthropologist* 94 (2): 376–97.

- Schmidt, Karl Horst. 1991. Latin and Celtic: Genetic relationship and areal contacts. *Bulletin of the Board of Celtic Studies* 38:1–19.
- Schrijver, Peter. 2001. Lost languages in northern Europe. In *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations*, ed. Christian Carpelan, Asko Parpolo, and Petteri Koskikallio, pp. 417–425. *Memories de la Société Finno-Ugrienne* 242. Helsinki: Suomalais-Ugrilainen Seura.
- Schuchhardt, C. 1919. *Alteuropa in seiner Kultur- und Stilentwicklung*. Berlin: Walter de Gruyter.
- Segalen, Martine. 1991. *Fifteen Generations of Bretons: Kinship and Society in Lower Brittany, 1720–1980*. Cambridge: Cambridge University Press.
- Shakanova, N. 1989. The system of nourishment among the Eurasian nomads: The Kazakh example. In *Ecology and Empire: Nomads in the Cultural Evolution of the Old World*, pp. 111–117. Los Angeles: University of Southern California Ethnographics Press.
- Shaoposhnikova, O. G. 1961. Novye dannye o Mikhailovskom poselenii. *Kratkie soobshcheniya institut arkhеologii* 11:38–42.
- Sharafutdinova, I. N. 1980. Severnaya kurgannaya grupa u s. Sokolovka. In *Arkhеologicheskie pamyatniki poingul'ya*, pp. 71–123. Kiev: Naukovo Dumka.
- Shaughnessy, Edward L. 1988. Historical perspectives on the introduction of the chariot into China. *Harvard Journal of Asian Studies* 48:189–237.
- Shennan, Stephen J., ed. 1989. *Archaeological Approaches to Cultural Identity*. London: Routledge.
- Sherratt, Andrew. 2003. The horse and the wheel: The dialectics of change in the circum-Pontic and adjacent areas, 4500–1500 BC. In *Prehistoric Steppe Adaptation and the Horse*, ed. Marsha Levine, C. Renfrew, and K. Boyle, pp. 233–252. McDonald Institute Monographs. Cambridge: University of Cambridge Press.
- . 1997a [1983]. The secondary exploitation of animals in the Old World. In *Economy and Society in Prehistoric Europe: Changing Perspectives*, rev. ed., ed. Andrew Sherratt, pp. 199–228. Princeton, N.J.: Princeton University Press.
- . 1997b. The introduction of alcohol to prehistoric Europe. In *Economy and Society in Prehistoric Europe*, ed. Andrew Sherratt, pp. 376–402. Princeton, N.J.: Princeton University Press.
- . 1997c [1991]. Sacred and profane substances: The ritual use of narcotics in later Neolithic Europe. In *Economy and Society in Prehistoric Europe*, ed. Andrew Sherratt, rev. ed. pp. 403–430. Princeton, N.J.: Princeton University Press.
- . 1986. Two new finds of wooden wheels from Later Neolithic and Early Bronze Age Europe. *Oxford Journal of Archaeology* 5:243–248.
- Sherratt, Andrew, and E. S. Sherratt. 1988. The archaeology of Indo-European: An alternative view. *Antiquity* 62 (236): 584–595.
- Shevchenko, A. I., 1957. Fauna poseleniya epokhi bronzy v s. Mikhailovke na nizhnem Dnepre. *Kratkie soobshcheniya institut arkhеologii* 7:36–37.
- Shilov, V. P. 1985a. Kurgannyi mogil'nik y s. Tsatsa. In *Drevnosti Kalmykii*, pp. 94–157. Elista: Kalmytskii nauchno-issledovatel'skii institut istorii, filologii i ekonomiki.
- . 1985b. Problemy proiskhozhdeniya kochevogo skotovodstva v vostochnoi Evropy. In *Drevnosti kalmykii*, pp. 23–33. Elista: Kalmytskii nauchno-issledovatel'skii institut istorii, filologii i ekonomiki.
- Shilov, V. P., and R. S. Bagautdinov. 1998. Pogebeniya Eneolita-rannei Bronzy mogil'nika Evdyk. In *Problemy drevnei istorii severnogo prikasiya*, ed. I. B. Vasiliev, pp. 160–178. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- Shishlina, N. I., ed. 2000. *Sezonnyi ekonomicheskii tsikl naseleniya severo-zapadnogo Prikasiya v Bronzovom Veke*. Vol. 120. Moscow: Trudy gosudarstvennogo istoricheskogo muzeya.
- , ed. 1999. *Tekstil' epokhi Bronzy Evraziiskikh stepei*. Vol. 109. Moscow: Trudy gosudarstvennogo istoricheskogo muzeya.

- . 1990. O slozhnom luke Srubnoi kul'tury. In *Problemy arkheologii evrazii*, ed. S. V. Studzitskaya, vol. 74, pp. 23–37. Moscow: Trudy gosudarstvennogo oedena Lenina istoricheskogo muzeya.
- Shishlina, N. I., and V. E. Bulatov. 2000. K voprosu o sezonnii sisteme ispol'zovaniya pastbishch nositelyami Yamnoi kul'tury Prikasiiskikh stepei v III tys. do n.e. In *Sezonnyi Ekonomichestv Tsikl Naseleeniya Severo-Zapadnogo Prikasiya v Bronzovom Veke*, ed. N. I. Shishlina, vol. 120, pp. 43–53. Moscow: Trudy gosudarstvennogo istoricheskogo muzeya.
- Shishlina, N. I., O. V. Orfinskaya, and V. P. Golikov. 2003. Bronze Age textiles from the North Caucasus: New evidence of fourth millennium BC fibres and fabrics. *Oxford Journal of Archaeology* 22 (4): 331–344.
- Shmagli, M. M., and M. Y. Videiko. 1987. Piznotripil'ske poseleniya poblizu s. Maidanets'kogo na Cherkashchini. *Arkeologiya* (Kiev) 60:58–71.
- Shnirelman, Victor, A. 1999. Passions about Arkaim: Russian nationalism, the Aryans, and the politics of archaeology. *Inner Asia* 1:267–282.
- . 1998. Archaeology and ethnic politics: The discovery of Arkaim. *Museum International* 50 (2): 33–39.
- . 1995. Soviet archaeology in the 1940s. In *Nationalism, Politics, and the Practice of Archaeology*, ed. Philip L. Kohl and Clare Fawcett, pp. 120–138. Cambridge: Cambridge University Press.
- . 1992. The emergence of food-producing economy in the steppe and forest-steppe zones of Eastern Europe. *Journal of Indo-European Studies* 20:123–143.
- Shorin, A. F. 1993. O za Uralskoi oblasti areala lesnikh Eneoliticheskikh kul'tur grebenchatoi keramiki. In *Voprosy arkheologii Urala*, pp. 84–93. Ekaterinburg: Uralskii gosudarstvennyi universitet.
- Shramko, B. A., and Y. A. Mashkarov. 1993. Issledovanie bimetallicheskogo nozha iz pogrebeniya Katakombnoi kul'tury. *Rossiskaya arkheologiya* (2): 163–170.
- Siegel, Jeff. 1985. Koines and koineisation. *Language in Society* 14:357–378.
- Silver, Shirley, and Wick R. Miller. 1997. *American Indian Languages: Cultural and Social Contexts*. Tucson: University of Arizona Press.
- Simkins, P. D., and F. L. Wernstedt. 1971. *Philippines Migration: Settlement of the Digos-Padada Valley, Padao Province*. Southeast Asia Studies 16. New Haven: Yale University Press.
- Sinitsyn, I. V. 1959. Arkheologicheskie issledovaniya Zavolzhskogo otriada (1951–1953). *Materialy i issledovaniya Institut arkheologii* (Moscow) 60:39–205.
- Siniuk, A. T., and I. A. Kozmarchuk. 1995. Nekotorye aspekti izucheniya Abashevskoi kul'tury v basseine Dona. In *Drevnie IndoIranskie Kul'tury Volgo-Ural'ya*, ed. V. S. Gorbunov, pp. 37–72. Samara: Samarskogo gosudarstvennogo pedagogicheskogo universiteta.
- Sinor, Dennis, ed. 1988. *The Uralic Languages*. Leiden: Brill.
- . 1972. Horse and pasture in Inner Asian history. *Oriens Extremus* 19:171–183.
- Skjærvø, P. Oktor. 1995. The Avesta as a source for the early history of the Iranians. In *The Indo-Aryans of Ancient South Asia: Language, Material Culture and Ethnicity*, ed. George Erdosy, pp. 155–176. Indian Philology and South Asian Studies 1. Berlin: Walter de Gruyter.
- Smith, Anthony D. 1998. *Nationalism and Modernism*. London: Routledge.
- Smith, Bruce. 1989. Origins of agriculture in eastern North America. *Science* 246 (4937): 1,566–1,571.
- Smith, John Masson. 1984. Mongol campaign rations: Milk, marmots, and blood? In *Turks, Hungarians, and Kipchaks: A Festschrift in Honor of Tibor Halasi-Kun*, ed. şinasi Tekin and Gönül Alpay Tekin. *Journal of Turkish Studies* 8:223–228. Cambridge, Mass.: Harvard University Print Office.
- Snow, Dean. 1994. *The Iroquois*. Oxford: Blackwell.
- Solovyova, N. F., A. N. Yegor'kov, V. A. Galibin, and Y. E. Berezkin. 1994. Metal artifacts from Ilgynly-Depe, Turkmenistan. In *New Archaeological Discoveries in Asiatic Russia and*

- Central Asia*, ed. A. G. Kozintsev, V. M. Masson, N. F. Solovyova, and V. Y. Zuyev, pp. 31–35. Archaeological Studies 16. St. Petersburg: Institute of the History of Material Culture.
- Sorokin, V. Y. 1989. Kulturno-istoricheski problemy plemen srednego Tripolya Dnistrovsko-Prutskogo mezhdurechya. *Izvestiya Akademii Nauk Moldavskoi SSR* 3:45–54.
- Southworth, Franklin. 1995. Reconstructing social context from language: Indo-Aryan and Dravidian prehistory. In *The Indo-Aryans of Ancient South Asia: Language, Material Culture and Ethnicity*, ed. George Erdosy, pp. 258–277. Indian Philology and South Asian Studies 1. Berlin: Walter de Gruyter.
- Sparreboom, M. 1985. *Chariots in the Vedas*. Edited by J. C. Heesterman and E. J. M. Witzel. Memoirs of the Kern Institute 3. Leiden: Brill.
- Spear, Thomas, and Richard Waller, eds. 1993. *Being Maasai: Ethnicity and Identity in East Africa*. Oxford: James Currey.
- Specht, F. 1944. *Der Ursprung der Indogermanischen Deklination*. Göttingen: Vandenhoeck and Ruprecht.
- Spicer, Edward. 1971. Persistent cultural systems: A comparative study of identity systems that can adapt to contrasting environments. *Science* 174:795–800.
- Spielmann, Katherine A., ed. 1998. *Migration and Reorganization: The Pueblo IV Period in the American Southwest*. Anthropological Research Papers 51. Tempe: Arizona State University Press.
- Spinage, C. A. 1972. Age estimation of zebra. *East African Wildlife Journal* 10:273–277.
- Stark, Miriam T., ed. 1998. *The Archaeology of Social Boundaries*. Washington, D.C.: Smithsonian Institution Press.
- Stein, Gil. 1999. *Rethinking World Systems: Diasporas, Colonies, and Interaction in Uruk Mesopotamia*. Tucson: University of Arizona Press.
- Stevanovic, Mirjana. 1997. The Age of Clay: The Social Dynamics of House Destruction. *Journal of Anthropological Archaeology* 16:334–395.
- Stewart, Ann H. 1976. *Graphic Representation of Models in Linguistic Theory*. Bloomington: Indiana University Press.
- Stillman, Nigel, and Nigel Tallis. 1984. *Armies of the Ancient Near East*. Worthing, Sussex: Flexiprint.
- Sturtevant, William. 1962. The Indo-Hittite hypothesis. *Language* 38:105–110.
- Subbotin, L.V. 1995. Grobniki Kemi-Obinskogo tipa severo-zapadnogo Prichernomor'ya. *Rossiskaya arkheologiya* (3): 193–197.
- . 1990. Uglubennye zhilishcha kul'tury Gumelnitsa v nizhnem podunav'e. In *Rannezemel'dcheski poseleniya-giganty Tripol'skoi kul'tury na Ukraine*, ed. I. T. Chenyakov, pp. 177–182. Tal'yanki: Institut arkheologii AN USSR.
- . 1985. Semenovskii mogil'nik epokhi Eneolita-Bronzy. In *Novye material'i po arkheologii severo-zapadnogo prichernomor'ya*, ed. V. N. Stanko, pp. 45–95. Kiev: Naukovo Dumka.
- . 1978. O sinkhronizatsii pamyatnikov kul'tury Gumelnitsa v nizhnem Podunav'e. In *Arkheologicheskie issledovaniya severo-zapadnogo prichernomor'ya*, ed. V. N. Stanko, pp. 29–41. Kiev: Naukovo Dumka.
- Summers, Geoffrey D. 2001. Questions raised by the identification of the Neolithic, Chalcolithic, and Early Bronze Age horse bones in Anatolia. In *Greater Anatolia and the Indo-Hittite Language Family*, ed. Robert Drews, pp. 285–292. Journal of Indo-European Studies Monograph 38. Washington, D.C.: Institute for the Study of Man.
- Sutton, Richard E. 1996. The Middle Iroquoian colonization of Huronia. Ph.D. dissertation. McMaster University, Hamilton, Ontario.
- Swadesh, M. 1955. Towards greater accuracy in lexicostatistic dating. *International Journal of American Linguistics* 21:121–37.
- . 1952. Lexico-statistic dating of prehistoric ethnic contacts. *Proceedings of the American Philosophical Society* 96:452–463.

- Syvolap, M. P. 2001. Kratkaya kharakteristika pamyatnikov Yamnoi kul'tury srednego podneprov'ya. In *Bronzovyj vek vostochnoi Evropy: Kharakteristika kul'tur, khronologiya i periodizatsiya*, ed. Y. I. Kolev, P. F. Kuznetsov, O. V. Kuzmina, A. P. Semenova, M. A. Turetskii, and B. A. Aguzarov, pp. 109–117. Samara: Samarskii Gosudarstvennyi Pedagogicheskii Universitet.
- Szemerényi, Oswald. 1989. The new sound of Indo-European. *Diachronica* 6:237–269.
- Szmyt, Marzena. 1999. *Between West and East: People of the Globular Amphorae Culture in Eastern Europe, 2950–2350 BC*. Baltic-Pontic Studies 8. Poznań: Adam Mickiewicz University.
- Tatarintseva, N. S. 1984. Keramika poseleniya Vishnevka 1 v lesostepnom pri Ishim'e. In *Bronzovyj Vek Uralo-Irtyshskogo Mezhdurech'ya*, pp. 104–113. Chelyabinsk: Chelyabinskii gosudarstvennyi universitet.
- Telegin, D. Y. 2005. The Yamna culture and the Indo-European homeland problem. *Journal of Indo-European Studies* 33 (3–4): 339–358.
- . 2002. A discussion on some of the problems arising from the study of Neolithic and Eneolithic cultures in the Azov-Black Sea region. In *Ancient Interactions: East and West in Eurasia*, ed. Katie Boyle, Colin Renfrew, and Marsha Levine, pp. 25–47. Cambridge: McDonald Institute for Archaeological Research.
- . 1996. Yugo-zapad vostochnoi Evropy; and Yug vostochnoi Evropy. In *Neolit severnoi evrazii*, ed. S. V. Oshibkina, pp. 19–86. Moscow: Nauka.
- . 1991. *Neoliticheskie mogil'niki mariupol'skogo tipa*. Kiev: Naukovo Dumka.
- . 1988. Keramika rannogo Eneolita tipu Zasukhi v lisostepovom liboberezhzhii Ukraini. *Arkheologiya* (Kiev) 64:73–84.
- . 1987. Neolithic cultures of the Ukraine and adjacent areas and their chronology. *Journal of World Prehistory* 1 (3): 307–331.
- . 1986. *Dereivka: A Settlement and Cemetery of Copper Age Horse Keepers on the Middle Dnieper*. Edited by J. P. Mallory. Translated by V. K. Pyatkovskiy. British Archaeological Reports International Series 287. Oxford: Archeopress.
- . 1982. *Mezolitichni pam'ятки Ukrayini*. Kiev: Naukovo Dumka.
- . 1981. Pro neolitichni pam'ятки Podonnya i steponogo Povolzhya. *Arkheologiya* (Kiev) 36:3–19.
- . 1977. Review of Markevich, V. I., 1974. *Bugo-Dnistrovskaya kul'tura na territorii Moldavii*. *Arkheologiya* (Kiev) 23:88–91.
- . 1973. *Seredno-Stogiv's'ka kul'tura Epokha Midi*. Kiev: Naukovo Dumka.
- . 1968. *Dnipro-Donets'ka kul'tura*. Kiev: Naukovo Dumka.
- Telegin, D. Y., and James P. Mallory. 1994. *The Anthropomorphic Stelae of the Ukraine: The Early Iconography of the Indo-Europeans*. Journal of Indo-European Studies Monograph 11. Washington D.C.: Institute for the Study of Man.
- Telegin, D. Y., A. L. Nechitailo, I. D. Potekhina, and Y. V. Panchenko. 2001. *Srednestogovskaya i novodanilovskaya kul'tury Eneolita Azovo-Chernomorskogo regiona*. Lugansk: Shlyakh.
- Telegin, D. Y., and I. D. Potekhina. 1987. *Neolithic Cemeteries and Populations in the Dnieper Basin*, ed. J. P. Mallory. British Archaeological Reports International Series 383. Oxford: Archeopress.
- Telegin, D. Y., I. D. Potekhina, M. Lillie, and M. M. Kovaliukh. 2003. Settlement and economy in Neolithic Ukraine: A new chronology. *Antiquity* 77 (296): 456–470.
- . 2002. The chronology of the Mariupol-type cemeteries of Ukraine revisited. *Antiquity* 76:356–363.
- Telegin, D. Y., Sergei Z. Pustalov, and N. N. Kovalyukh. 2003. Relative and absolute chronology of Yamnaya and Catacomb monuments: The issue of co-existence. *Baltic-Pontic Studies* 12:132–184.
- Teplova, S. N. 1962. *Atlas SSSR*. Moscow: Ministerstvo geologii i okhrany nedor SSSR.
- Terrell, John Edward, ed. 2001. *Archaeology, Language and History: Essays on Culture and Ethnicity*. Westport, Conn.: Bergin and Garvey.

- Terrell, John Edward, T. L. Hunt, and Chris Godsen. 1997. The dimensions of social life in the Pacific: Human diversity and the myth of the primitive isolate. *Current Anthropology* 38:155–195.
- Thieme, Paul. 1960. The Aryan gods of the Mitanni treaties. *Journal of the American Oriental Society* 80:310–317.
- . 1958. The Indo-European language. *Scientific American* 199 (4): 63–74.
- Thomason, Sarah Gray, and Terrence Kaufman. 1988. *Language Contact, Creolization, and Genetic Linguistics*. Los Angeles: University of California Press.
- Thornton, C. P., and C. C. Lamberg-Karlovsky. 2004. A new look at the prehistoric metallurgy of southeastern Iran. *Iran* 42:47–59.
- Timofeev, V. I., and G. I. Zaitseva. 1997. K probleme radiouglerodnoi khronologii Neolita stepnoi i juga lesnoi zony Evropeiskoi chasti Rossii i Sibiri. *Radiouglerod i arkheologiya* (St. Petersburg) 2:98–108.
- Todorova, Henrietta. 1995. The Neolithic, Eneolithic, and Transitional in Bulgarian Prehistory. In *Prehistoric Bulgaria*, ed. Douglass W. Bailey and Ivan Panayotov, pp. 79–98. Monographs in World Archaeology 22. Madison, Wis.: Prehistory Press.
- Tolstov, S. P., and A. S. Kes'. 1960. *Nizov'ya Amu-Dar'i, Sarykamysh, Uzboi: Istorija formirovaniya i zaseleniya*. Vol. 3. Moscow: Materialy khorezmskoi ekspeditsii.
- Tovkailo, M. T. 1990. Do pitannya pro vzaemini naseleniya Bugo-Dnistrovskoi ta ranne Triplil'skoi kul'tur u stepovomu po Buzhi. In *Rannezemledel'cheskie poseleniya-Giganty Tripol'skoi Kul'tury na Ukraine*, ed. V. G. Zbenovich, and I. T. Chernyakov, pp. 191–194. Tal'yanki: Institut arkheologii akademiya nauk.
- Trifonov, V. A. 2001. Popravki absoliutnoi khronologii kultur epokha Eneolita-Srednei Bronzy Kavkaza, stepnoi i lesostepnoi zon vostochnoi Evropy (po dannym radiouglerodnogo datirovaniya). In *Bronzovyj vek Vostochnoi Evropy: Kharakteristika kul'tur, Khronologiya i Periodizatsiya*, ed. Y. I. Kolev, P. F. Kuznetsov, O. V. Kuzmina, A. P. Semenova, M. A. Turetskii, and B. A. Aguzarov, pp. 71–82. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- . 1991. Stepnoe prikuban'e v epokhu Eneolita: Srednei Bronzy (periodizatsiya). In *Drevnie kul'tury Prikubanya*, ed. V. M. Masson, pp. 92–166. Leningrad: Nauka.
- Tringham, Ruth. 1971. *Hunters, Fishers and Farmers of Eastern Europe, 6000–3000 BC*. London: Hutchinson.
- Troy, C. S., D. E. MacHugh, J. F. Bailey, D. A. Magee, R. T. Loftus, P. Cunningham, A. T. Chamberlain, B. C. Sykes, and D. G. Bradley. 2001. Genetic Evidence for Near-Eastern Origins of European Cattle. *Nature* 410:1088–1091.
- Trudgill, Peter. 1986. *Dialects in Contact*. Oxford: Blackwell.
- Tuck, J. A. 1978. Northern Iroquoian prehistory. In *Northeast Handbook of North American Indians*, ed. Bruce G. Trigger, vol. 15, pp. 322–333. Washington, D.C.: Smithsonian Institution Press.
- Uerpmann, Hans-Peter. 1990. Die Domestikation des Pferdes im Chalcolithikum West- und Mitteleuropas. *Madridrer Mittteilungen* 31:109–153.
- Upton, Dell, and J. M. Vlach, eds. 1986. *Common Places: Readings in American Vernacular Architecture*. Athens: University of Georgia Press.
- Ursulescu, Nicolae. 1984. *Evoluția Culturii Starčevo-Criș Pe Teritoriul Moldovei*. Suceava: Muzeul Județean Suceava.
- Vainshtein, Sevyan. 1980. *Nomads of South Siberia: The Pastoral Economies of Tuva*. Edited by Caroline Humphrey. Translated by M. Colenso. Cambridge: Cambridge University Press.
- Van Andel, T. H., and C. N. Runnels. 1995. The earliest farmers in Europe. *Antiquity* 69:481–500.
- Van Buren, G. E. 1974. *Arrowheads and Projectile Points*. Garden Grove, Calif.: Arrowhead.
- Vasiliev, I. B. 2003. Khvalynskaya Eneoliticheskaya kul'tura Volgo-Ural'skoi stepi i lesostepi (nekotorye itogi issledovaniya). *Voprosy Arkeologii Povolzh'ya* v.3: 61–99. Samara: Samarskii Gosudarstvennyi Redagogicheskii Univerditet.

- Vasiliev, I. B., ed. 1998. *Problemy drevnei istorii severnogo prikasiya*. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- . 1981. *Eneolit Povolzhya*. Kuibyshev: Kuibyshevskii gosudarstvennyi pedagogicheskii institut.
- . 1980. Mogil'nik Yamno-Poltavkinskogo veremeni u s. Utyevka v sredнем Povolzh'e. In *Arkheologiya Vostochno-Europeiskoi Lesostepi*, pp. 32–58. Voronezh: Voronezhskogo universiteta.
- Vasiliev, I. B., and G. I. Matveeva. 1979. Mogil'nik u s. S'yezhee na R. Samare. *Sovietskaya arkheologiya* (4): 147–166.
- Vasiliev, I. B., P. F. Kuznetsov, and A. P. Semenova. 1994. *Potapovskii Kurgannyi Mogil'nik Indoiranskikh Plemen na Volge*. Samara: Samarskii universitet.
- Vasiliev, I. B., P. F. Kuznetsov, and M. A. Turetskii. 2000. Yamnaya i Poltavkinskaya kul'tura. In *Istoriya samarskogo po volzh'ya s drevneishikh vremen do nasibikh dnei: Bronzovyi Vek*, ed. Y. I. Kolev, A. E. Mamontov, and M. A. Turetskii, pp. 6–64. Samara: Samarskogo nauchnogo tsentra RAN.
- Vasiliev, I. B., and N. V. Ovchinnikova. 2000. Eneolit. In *Istoriya samarskogo povolzh'ya s drevneishikh vremen do nasibikh dnei*, ed. A. A. Vybornov, Y. I. Kolev, and A. E. Mamontov, pp. 216–277. Samara: Integratsiya.
- Vasiliev, I. B., and Siniuk, A. T. 1984. Cherkasskaya stoianka na Sredнем Donu. In *Epokha Medi Iuga Vostochnoi Evropy*, ed. S. G. Basina and G. I. Matveeva, pp. 102–129. Kuibyshev: Kuibyshevskii gosudarstvennyi pedagogicheskii institut.
- Vasiliev, I. B., A. Vybornov, and A. Komarov. 1996. *The Mesolithic of the North Caspian Sea Area*. Samara: Samara State Pedagogical University.
- Vasiliev, I. B., A. A. Vybornov, and N. L. Morgunova. 1985. Review of *Eneolit iuzhnogo Urala* by G. N. Matiushin. *Sovetskaia arkheologiya* (2): 280–289.
- Veenhof, Klaas R. 1995. Kanesh: An Assyrian Colony in Anatolia. In *Civilizations of the Ancient Near East*, ed. Jack M. Sasson, John Baines, Gary Beckman, and Karen R. Rubinon, vol. 1, pp. 859–871. New York: Scribner's.
- Vehik, Susan. 2002. Conflict, trade, and political development on the southern Plains. *American Antiquity* 67 (1): 37–64.
- Veit, Ulrich. 1989. Ethnic concepts in German prehistory: A case study on the relationship between cultural identity and archaeological objectivity." In *Archaeological Approaches to Ethnic Identity*, ed. S. J. Shennan, pp. 35–56. London: Unwin Hyman.
- Venneman, Theo. 1994. Linguistic reconstruction in the context of European prehistory. *Transactions of the Philological Society* 92:215–284.
- Videiko, Mihailo Y. 2003. Radiocarbon chronology of settlements of BII and CI stages of the Tripolye culture at the middle Dnieper. *Baltic-Pontic Studies* 12:7–21.
- . 1999. Radiocarbon dating chronology of the late Tripolye culture. *Baltic-Pontic Studies* 7:34–71.
- . 1990. Zhilishchno-khozyaistvennye kompleksy poseleniya Maidanetskoe i voprosy ikh interpretatsii. In *Rannezemel'edel'cheskie Poseleniya-Giganty Tripol'skoi kul'tury na Ukraine*, ed. I. T. Cherniakhov, pp. 115–120. Tal'yanki: Vinnitskii pedagogicheskii institut.
- Videiko, Mihailo Y., and Vladislav H. Petrenko. 2003. Radiocarbon chronology of complexes of the Eneolithic–Early Bronze Age in the North Pontic region, a preliminary report. *Baltic-Pontic Studies* 12:113–120.
- Vilà, Carles, J. A. Leonard, A. Götherström, S. Marklund, K. Sandberg, K. Lidén, R. K. Wayne, and Hans Ellegren. 2001. Widespread origins of domestic horse lineages. *Science* 291 (5503): 474–477.
- Vinogradov, A. V. 1981. *Drevnie okhotniki i rybolovy sredneaziatskogo mezhdorechya*. Vol. 10. Moscow: Materialy khorezmanskoi ekspeditsii.
- . 1960. Novye Neoliticheskie nakhodki Korezmskoi ekspeditsii AN SSSR 1957 g. In *Polevye issledovaniya khorezmanskoi ekspeditsii v 1957 g.*, ed. S. P. Tolstova, vol. 4, pp. 63–81. Moscow: Materialy khorezmanskoi ekspeditsii.

- Vinogradov, Nikolai. 2003. *Mogil'nik Bronzovogo Beka: Krivoe ozero v yuzhnom Zaural'e*. Chelyabinsk: Yuzhno-Ural'skoe knizhnoe izdatel'stvo.
- Vörös, Istvan. 1980. Zoological and paleoeconomical investigations on the archaeozoological material of the Early Neolithic Körös culture. *Folia Archaeologica* 31:35–64.
- Vybornov, A. A., and V. P. Tretyakov. 1991. Stoyanka Imerka VII v Primokshan. In *Drevnosti Vostochno-Europeiskoi Lesotepi*, ed. V. V. Nikitin, pp. 42–55. Samara: Samarskii gosudarstvennyi pedagogicheskii institut.
- Währen, M. 1989. Brot und Gebäck von der Jungsteinzeit bis zur Römerzeit. *Helvetia Archaeologica* 20:82–116.
- Walcot, Peter. 1979. Cattle raiding, heroic tradition, and ritual: The Greek evidence. *History of Religions* 18:326–351.
- Watkins, Calvert. 1995. *How to Kill a Dragon: Aspects of Indo-European Poetics*. Oxford: Oxford University Press.
- Weale, Michael E., Deborah A. Weiss, Rolf F. Jager, Neil Bradman, and Mark G. Thomas. 2002. Y Chromosome Evidence for Anglo-Saxon Mass Migration. *Molecular Biology and Evolution* 19:1008–1021.
- Weber, Andrzej, David W. Link, and M. Anne Katzenberg. 2002. Hunter-gatherer culture change and continuity in the Middle Holocene of the Cis-Baikal, Siberia. *Journal of Anthropological Archaeology* 21:230–299.
- Wechler, Klaus-Peter, V. Dergachev, and O. Larina. 1998. Neue Forschungen zum Neolithikum Osteuropas: Ergebnisse der Moldawisch-Deutschen Geländearbeiten 1996 und 1997. *Praehistorische Zeitschrift* 73 (2): 151–166.
- Weeks, L. 1999. Lead isotope analyses from Tell Abraq, United Arab Emirates: New data regarding the “tin problem” in Western Asia. *Antiquity* 73:49–64.
- Weisner, Joseph. 1968. *Fahren und Reiten*. Göttingen: Vandenhoeck und Ruprecht, Archaeologia HomERICA.
- . 1939. Fahren und Reiten in Alteuropa und im alten Orient. In *Der Alte Orient* Bd. 38, fascicles 2–4. Leipzig: Heinrichs Verlag.
- Weiss, Harvey. 2000. Beyond the Younger Dryas: Collapse as adaptation to abrupt climate change in ancient West Asia and the Eastern Mediterranean. In *Environmental Disaster and the Archaeology of Human Response*, ed. Garth Bawden and Richard M. Reyraft, pp. 75–98. Anthropological Papers no. 7. Albuquerque: Maxwell Museum of Anthropology.
- Weissner, Polly. 1983. Style and social information in Kalahari San projectile points. *American Antiquity* 48 (2): 253–275.
- Wells, Peter S. 2001. *Beyond Celts, Germans and Scythians: Archaeology and Identity in Iron Age Europe*. London: Duckworth.
- . 1999. *The Barbarians Speak*. Princeton, N. J.: Princeton University Press.
- White, Randall. 1989. Husbandry and herd control in the Upper Paleolithic: A critical review of the evidence. *Current Anthropology* 30 (5): 609–632.
- Wilhelm, Gernot. 1995. The Kingdom of Mitanni in Second-Millennium Upper Mesopotamia. In *Civilizations of the Ancient Near East*, vol. 2, ed. Jack M. Sasson, John Baines, G. Beckman, and Karen S. Robinson, pp. 1243–1254. New York: Scribner's.
- Wilhelm, Hubert G. H. 1992. Germans in Ohio. In *To Build in a New Land: Ethnic Landscapes in North America*, ed. Allen G. Noble, pp. 60–78. Baltimore, Md.: Johns Hopkins University Press.
- Willis, K. J. 1994. The vegetational history of the Balkans. *Quaternary Science Reviews* 13: 769–788.
- Winckelmann, Sylvia. 2000. Intercultural relations between Iran, the Murghab-Bactrian Archaeological Complex (BMAC), northwest India, and Falaika in the field of seals. *East and West* 50 (1–4): 43–96.
- Winn, S.M.M., 1981. *Pre-Writing in Southeastern Europe: The Sign System of the Vinča Culture ca. 4000 B.C.* Calgary: Western.

- Witzel, Michael. 2003. *Linguistic Evidence for Cultural Exchange in Prehistoric Western Central Asia*. Sino-Platonic Papers 129:1–70. Philadelphia: Department of Asian and Middle Eastern Languages, University of Pennsylvania.
- . 1995. Rgvedic history: Poets, chieftans, and polities. In *The Indo-Aryans of Ancient South Asia: Language, Material Culture and Ethnicity*, ed. George Erdösy, pp. 307–352. Indian Philology and South Asian Studies 1. Berlin: Walter de Gruyter.
- Wolf, Eric. 1984. Culture: Panacea or problem? *American Antiquity* 49 (2): 393–400.
- . 1982. *Europe and the People without History*. Berkeley: University of California Press.
- Wylie, Alison. 1995. Unification and convergence in archaeological explanation: The agricultural “wave of advance” and the origins of Indo-European languages. In *Explanation in the Human Sciences*, ed. David K. Henderson, pp. 1–30. Southern Journal of Philosophy Supplement 34. Memphis: Department of Philosophy, University of Memphis.
- Yanko-Hombach, Valentina, Allan S. Gilbert, Nicolae Panin, and Pavel M. Dolukhanov. 2006. *The Black Sea Flood Question: Changes in Coastline, Climate, and Human Settlement*. NATO Science Series. Dordrecht: Springer.
- Yanushovich, Zoya V. 1989. Agricultural evolution north of the Black Sea from the Neolithic to the Iron Age. In *Foraging and Farming: The Evolution of Plant Exploitation*, ed. David R. Harris and Gordon C. Hillman, pp. 607–619. London: Unwin Hyman.
- Yarovoy, E. V. 1990. *Kurgany Eneolita-epokhi Bronzny nizhnego poDnestr'ya*. Kishinev: Shtiintsa.
- Yazepenka, Igor, and Aleksandr Koško. 2003. Radiocarbon chronology of the beakers with short-wave moulding component in the development of the Middle Dnieper culture. *Baltic-Pontic Studies* 12:247–252.
- Yener, A. 1995. Early Bronze Age tin processing at Göltepe and Kestel, Turkey. In *Civilizations of the Ancient Near East*, ed. Jack M. Sasson, John Baines, Gary Beckman, and Karen R. Robinson, vol. 3, pp. 1519–1521. New York: Scribner's.
- Yudin, A. I. 1998. Orlovskaya kul'tura i istoki formirovaniya stepnego Eneolita za Volzh'ya. In *Problemy Drevnej Istorii Severnogo Prikasiya*, pp. 83–105. Samara: Samarskii gosudarstvennyi pedagogicheskii universitet.
- . 1988. Varfolomievka Neoliticheskaya stoianka. In *Arkeologicheskie kul'tury severnogo Prikasiya*, pp. 142–172. Kuibyshev: Kuibyshevskii gosudarstvenii pedagogicheskii institut.
- Zaibert, V. F. 1993. *Eneolit Uralo-Irtyshskogo Mezhdurech'ya*. Petropavlovsk: Nauka.
- Zaikov, V. V., G. B. Zdanovich, and A. M. Yuminov. 1995. Mednyi rudnik Bronzogo veka “Vorovskaya Yama.” In *Rossiya i Vostok: Problemy Vzaimodeistviya*, pt. 5, bk. 1: *Kul'tury Eneolita-Bronzy Stepnoi Evrazii*, pp. 157–162. Chelyabinsk: 3-ya Mezhdunarodnaya nauchnaya konferentsiya.
- Zaitseva, G. I., V. I. Timofeev, and A. A. Sementsov. 1999. Radiouglerodnoe datirovanie v IIMK RAN: istoriya, sostoyanie, rezul'taty, perspektivy. *Rossiiskaya arkheologiya* (3): 5–22.
- Zbenovich, V. G. 1996. The Tripolye culture: Centenary of research. *Journal of World Prehistory* 10 (2): 199–241.
- . 1980. *Poselenie Bernashevka na Dnestre (K Proiskhozhdeniu Tripol'skoi Kul'tury)*. Kiev: Naukovo Dumka.
- . 1974. *Posdnetripl'skie plemena severnogo Prichernomor'ya*. Kiev: Naukovo Dumka.
- . 1968. Keramika usativ'skogo tipu. *Arkheologiya* (Kiev) 21:50–78.
- Zdanovich, G. B., ed. 1995. *Arkaim: Issledovaniya, Poiski, Otkrytiya*. Chelyabinsk: “Kammennyi Poyas.”
- . 1988. *Bronzovyj Vek Uralo-Kazakhstanskikh Stepei*. Sverdlovsk: Ural'skogo universiteta, for Berlyk II.
- Zeder, Melinda. 1986. The equid remains from Tal-e Malyan, southern Iran. In *Equids in the Ancient World*, vol. 1, ed. Richard Meadow and Hans-Peter Uerpmann, pp. 366–412. Weisbaden: Reichert.

- Zelinsky, W. 1973. *The Cultural Geography of the United States*. Englewood Cliffs, N.J.: Prentice-Hall.
- Zhauymbaev, S. U. 1984. Drevnie mednye rudniki tsentral'nogo Kazakhstana. In *Bronzovyj Vek Uralo-Irtyshskogo Mezhdurech'ya*, pp. 113–120. Chelyabinsk: Chelyabinskii gosudarstvennyi universitet.
- Zimmer, Stefan. 1990. The investigation of Proto-Indo-European history: Methods, problems, limitations. In *When Worlds Collide: Indo-Europeans and the Pre-Indo-Europeans*, ed. T. L. Markey, and John A. C. Greppin, pp. 311–344. Ann Arbor, Mich.: Karoma.
- Zin'kovskii, K. V., and V. G. Petrenko. 1987. Pogrebeniya s okhroi v Usatovskikh mogil'nikakh. *Sovietskaya arkheologiya* (4): 24–39.
- Zöller, H. 1977. Alter und Ausmass postgläzialer Klimaschwankungen in der Schweizer Alpen. In *Dendrochronologie und Postgläziale Klimaschwangungen in Europa*, ed. B. Frenzel, pp. 271–281. Wiesbaden: Franz Steiner Verlag.
- Zutterman, Christophe. 2003. The bow in the ancient Near East, a re-evaluation of archery from the late 2nd millennium to the end of the Achaemenid empire. *Iranica Antiqua* 38: 119–165.
- Zvelebil, Marek. 2002. Demography and dispersal of early farming populations at the Mesolithic/Neolithic transition: Linguistic and demographic implications. In *Examining the Farming/Language Dispersal Hypothesis*, ed. Peter Bellwood and Colin Renfrew, pp. 379–394. Cambridge: McDonald Institute for Archaeological Research.
- . 1995. Indo-European origins and the agricultural transition in Europe. *Journal of European Archaeology* 3:33–70.
- Zvelebil, Marek, and Malcolm Lillie. 2000. Transition to agriculture in eastern Europe. In *Europe's First Farmers*, ed. T. Douglas Price, pp. 57–92. Cambridge: Cambridge University Press.
- Zvelebil, Marek, and Peter Rowley-Conwy. 1984. Transition to farming in northern Europe: A hunter-gatherer perspective. *Norwegian Archaeological Review* 17:104–128.
- Zvelebil, Marek, and K. Zvelebil. 1988. Agricultural transition and Indo-European dispersals. *Antiquity* 62:574–583.

*This page intentionally left blank*

# INDEX



- Abashevo culture, Russia, 378, 382–86, 389, 390, 395, 410, 413, 428, 431, 437, 447, 501–4
- Acholi chiefdom, 117–18, 259, 478
- Afanasievo culture, 267, 275, 307–11, 359, 443, 495, 496; and Tocharian languages, 264–65, 305, 311
- Afro-Asiatic languages, 76, 136, 146, 304, 305, 475, 480, 495
- allophone, 22
- Amazons, 329, 497
- amber, 355, 498
- Anatolian languages, 14, 28, 43–48, 50, 52, 57, 60, 64, 75, 474; archaisms in, 46–48, 52, 82, 473, 495; in the Hittite empire, 43, 44, 45; internal diversity in, 44–46, 48, 53, 473; non-Indo-European borrowings in, 44–45, 49, 473; and PIE homeland in Anatolia, 75–81, 97–98, 100, 475; and steppe archaeology, 251, 259, 262, 265, 342, 492, 500
- Andronovo horizon, 448–57; Alakul and Federovo variants in, 448–49; link with Central Asia, 452–56; mining and metallurgy of, 450–51
- areal borrowing. *See* language borrowing
- Armenian language, 52, 53, 54, 55, 57, 60, 77, 369, 411, 462, 472, 495
- Arslan-tepe, Turkey, 61–62, 67–68, 74, 283–84, 289, 295, 474, 494
- Aryans, 9–10, 18, 213, 375, 408–11, 465, 502, 505
- Bactria-Margiana Archaeological Complex (BMAC); chronology of, 504; economy of, 425; horses of, 415, 425, 427, 431, 504; link to southern civilizations, 423, 425, 455–56; link to steppe cultures, 427–36, 444, 452–56, 504, 505; metal trade in, 391, 425, 413, 504; walled towns of, 414, 421, 424, 505
- Bailey, Douglass, 227, 482, 488
- Bal'ki kurgan, Ukraine, 70, 71, 74, 302, 316, 364, 496
- Baltic languages, 12, 13, 28, 29, 52, 55, 57, 60, 64, 82, 101, 306, 346, 348, 367, 380, 462, 479
- Bantu languages, 80, 81, 114, 117, 137
- Bernashevka settlement, Ukraine, 165, 166–73, 483
- bit wear. *See* horses
- Boas, Franz, 10, 114, 478
- Bökönyi, Sándor, 62, 214, 474, 485, 487, 488, 492, 493, 495, 498
- borders: ecological, 102, 114–16, 136–37, 148, 161, 216, 236, 463, 478; genetic, 105, 106–7, 113; linguistic, 41, 102–4, 107, 109, 114, 115, 131, 136–37, 146, 236, 238, 259, 305, 344, 368, 382, 385, 458, 463
- Botai settlement, Kazakhstan. *See* horses
- bows and bow remains, 55, 223–24, 236, 400, 488, 502
- bride-price, 110–11, 117, 239, 317, 364, 478, 490
- Bronocice, Poland, 62, 67, 68, 262, 311, 345
- Budakálasz cemetery, Hungary, 68, 69, 74
- Bug-Dniester culture, 144, 145, 147, 148, 159, 166, 480, 483; ceramics of, 148–49, 151; chronology of, 141, 151, 155, 156, 175, 483; diet of, 148, 151–54, 187, 481; graves of, 157; settlements of, 148, 154
- Cannabis, 264, 298, 362, 492, 494, 505
- Caspian Depression, 136–37, 148, 149, 161, 182, 188, 199, 214, 295, 325, 483, 484
- Catacomb culture, Russia and Ukraine, 70, 306, 307, 312, 322, 323, 325, 330, 336, 339, 369, 380, 383, 395, 437, 474, 496, 497, 504
- Catal Hüyük tell, Turkey, 74, 198, 484
- cattle raids, 91, 239, 364, 464, 499
- Caucasian languages, 44, 49, 93, 97, 98, 187, 297
- cavalry, 18, 19, 222, 224, 236, 488, 489, 503
- Celtic languages, 7, 28, 53, 55–56, 64, 88, 100, 105, 118, 160, 191, and archaeology, 305, 344, 367, 476, 500
- Cernavoda I and III cultures, Romania, 62, 221, 228, 241, 260–62, 269, 341, 349, 354, 362, 491, 492, 499

- chariots: in China, 403, 456; and Indo-Europeans, 18, 48, 133, 213, 448, 456; in the Near East, 397, 399, 400, 402–3, 417–18, 427, 431, 502, 503; in the Sintashta culture, 371, 376–77, 399–405, 408, 441; size, 399; in warfare, 397–405, 462, 502
- cheekpieces. *See* horses
- Chenopodium* (goosefoot) seeds in diet, 176, 303, 326, 405, 439, 497, 504
- Clayton, Hilary, 193, 194, 195, 485
- climate change and human ecology, 110, 136, 164, 197, 227–28, 230, 247, 258, 300–301, 389–91, 416, 440, 488, 489, 495, 501
- contracts, 45, 191, 326, 342, 366, 370
- copper metallurgy, 125, 163, 185, 225, 228, 263, 290, 336, 382, 389, 482, 484
- Corded Ware horizon, 306, 344, 345, 360, 367–68, 375, 377, 380, 382, 475, 500, 501
- core vocabulary. *See* language borrowing
- Cotsofeni culture, Romania, 241, 344, 345, 355, 357, 362, 363, 366, 498
- creole languages. *See* language borrowing
- Criş culture, 104, 139–47, 149, 151, 152, 153, 154, 156, 158, 167, 187, 203, 479, 480, 481, 483
- Csepel-Haros settlement, Hungary, 203, 204, 367
- Cucuteni C pottery, 164, 231–34, 236, 252, 260, 489–90
- Cucuteni-Tripolye culture, 84, 104, 105, 159, 164–73, 267, 368; cemeteries of, 167, 234–35, 264, 277, 350, 489; its contact with steppe cultures, 175, 177, 229, 230–39, 242–45, 252, 254, 257, 267, 269, 273, 346–49, 349–54, 489, 491, 498; copper metallurgy in, 163, 172–73, 181, 254, 273; craft specialization in, 229, 233, 281, 351, 489, 493; early settlements of, 166–74, 226, 483; economy of, 172, 351–53; female figurines of, 164, 171–72, 305; fortifications of, 230–31, 239, 281, 489; geographic expansion of, 159, 173, 232, 236, 264, 346, 491; giant towns of, 266, 277, 278–82, 493; late settlements of, 346–49, 279–82, 302, 344–48, 351, 353, 360, 377, 493, 500; origins of, 164–66
- daggers, 132, 228, 462, 499, 500, 501; in Central Asia, 420, 425, 427; in Cotsofeni, 366; in Maikop culture, 284, 291, 293, 297–98; in Seima-Turbino, 443, 444, 446, 447; in Sintashta, 372, 395, 399, 400; in Usatovo, 349, 353, 355–57, 359; in Yamnaya, 298, 304, 309, 319, 325, 334–36
- Dereivka, Ukraine, 165, 237, 240, 299, 487; age and sex of horses, 204–6, 485; bit wear on horses, 213–15; Dnieper-Donets II cemetery, 169, 175, 179, 483; size of horses, 202–4, 214, 488, 498; Sredni Stog cemetery, 245, 258; Sredni Stog settlement, 241–49, 273, 274, 490, 491
- Dergachev, Valentin, 140, 152, 173, 230, 232, 235, 480, 481, 483, 489, 491, 498, 499
- DiCosmo, Nicola, 322, 393, 460, 478, 491, 496, 502
- Divine Twins, 50, 55, 134, 456, 479
- Dnieper-Donets I Neolithic culture, Ukraine, 155–56, 481
- Dnieper-Donets II Eneolithic culture, Ukraine, 168, 174–82, 187, 481, 482, 483
- Dnieper Rapids, Ukraine, 142, 144, 149, 155, 157–59, 174–75, 176, 179, 201, 239, 246, 258, 268, 271, 272
- dogs, 176, 213, 215, 222, 248, 293, 324, 356, 376, 493, 501; and canine tooth ornaments, 362, 364–65, 411, 499; midwinter dog sacrifice of, 239, 364, 410–411; in Proto-Indo-European, 15, 56, 91, 94, 410, 503
- Drews, Robert, 97, 473, 485, 488, 490, 500, 503
- Dumezil, Georges, 92–93, 359
- Elamites, 413–14, 416–19, 423, 425, 431, 433, 454, 503
- Elshanka Neolithic settlement, Russia, 139, 141, 149, 150, 480
- Equus caballus*. *See* horses
- Equus hemionus* or onager, 136, 137, 158, 176, 186, 188, 198–99, 218, 275, 291, 298, 388, 402–4, 413, 417, 425, 482, 484, 503
- Equus hydruntinus*, 136, 148, 198, 199, 491
- Evdik kurgan, Russia, 68, 69, 74, 268, 283, 295, 297, 312, 320, 496
- Fatyanovo culture, Russia, 377, 379–83, 395, 396
- felt textiles, 60, 98, 137, 175, 298, 312, 330, 363, 461
- Flintbek cemetery, Germany, 66, 74
- frontiers, persistent, 17, 104–8, 112, 116, 119, 154, 158, 161, 297, 306, 463, 477, 478
- Galugai settlement, Russia, 266, 268, 283, 290, 298, 494

- Gamkrelidze, T., 97, 473, 474, 476, 495
- Gei, Aleksandr, 71, 312, 313, 322, 329, 337, 475, 484, 496
- gender and power, 10, 15, 92, 138, 328, 329, 479
- George, Christian, 206, 207, 211, 213, 486
- Germanic languages, 8, 10, 12, 14, 28, 29, 31, 37, 40, 53, 56, 82, 88, 101, 105–6, 134, 472, 476, 494, 495; and the Corded Ware horizon, 367–68; and the Usatovo culture, 343, 348, 359–60
- Gimbutas, Marija, 10, 83, 132, 162, 170, 180, 214, 230, 240, 458, 489, 494, 495; and the Kurgan culture, 214–15, 306–7, 319, 475; and Old Europe, 132, 162–64, 214, 225–30, 482
- glottochronology. *See* language change
- Gonur walled town, Turkmenistan, 413, 414, 421, 424–29, 431, 452, 505
- Grant, Madison, 9, 465
- Greek language, 32, 48–49; link to Indo-Iranian, 55–56, 237, 411, 473; Mycenaean origins, 32, 48–50, 368–69, 397, 401, 402, 411, 437, 447, 472, 492, 500, 502; non-Greek borrowings in, 88, 473, 476
- Greek Neolithic, 138, 139, 143, 146–47, 173, 259, 480
- Grimm's Law, 29, 472
- guest-host relationship, 31, 32, 191, 303, 327, 342, 343, 361, 461, 464, 465, 495
- Gumelnița culture, Romania, 163, 165, 226, 244, 261, 491
- Harappan civilization, 413–16, 419, 423, 425, 440, 503
- Häusler, Alexander, 214, 215, 474, 487, 497
- Herder, J. G. 8
- Hittite language and empire, 13, 14, 18, 36, 43–48, 50, 60, 76, 79, 134, 238, 262, 336, 473, 490, 495
- Hobsbawm, Eric, 103, 465, 476, 506
- honey and honey-bees, 14, 90–92, 98, 99, 164, 303, 384, 476, 492
- horizon styles, 131–32, 222, 237, 260–61, 272, 275, 300, 302, 303–4, 305, 307, 312, 317, 327, 336, 367, 410, 435, 443, 448, 450, 457
- horses, 6, 15, 18–19, 90–91, 98, 213, 459; behavior and ecology of, 135–36, 196–99, 200, 287, 299, 325, 388, 425, 479, 485, 488, 491, 494, 497, 498, 503, 504, 505; bit wear on, 193–96, 206–15, 218, 221, 485, 486, 488; at Botai, 202, 204, 216–20, 264, 266, 308, 388–89, 441, 487, 488; chariot teams of, 49, 224, 397–405, 418, 433, 462; cheekpieces for, 242, 369, 400–402, 502; at Dereivka, 213–15, 247, 487; in diet, 148, 158, 175–76, 186, 188–89, 198–99, 200, 204–6, 213, 216–17, 247–48, 274, 291, 298, 310, 351, 389, 406, 429, 449, 460, 487; DNA studies on, 196, 485; domestication of, 18–19, 21, 175, 193 ff., 200–201, 219, 221, 260, 299; dung of, 219–20; hunting of, 137, 148, 158, 161, 176, 186, 188, 189, 198–99, 200, 216–18, 220, 275; maceheads shaped like, 234–35, 251, 254, 256, 489, 491; riding of, 73, 118, 133, 206–15, 222–24, 230, 237, 246, 249, 301–2, 342, 416, 418, 454, 459–60, 475, 490, 503; in ritual, 55, 91, 133, 160, 179, 183–84, 188–90, 205, 215, 287, 284, 291–92, 304, 324–25, 342, 372, 406–7, 409, 427, 446, 455, 479, 484; statue of, 202–4, 237, 460, 488; trade in, 264, 274, 284, 298, 341–42, 351, 361, 412, 416–17, 421, 425, 427, 431, 452; in war, 222–24, 228, 239, 259, 342, 397–405, 433, 501
- hundred, Proto-Indo-European root, 13, 23, 27–30, 33, 36, 52
- Hurrian language, 49–50, 76, 454
- Icelandic language, 22–23, 41
- Igren settlements and cemetery, Ukraine, 144, 155, 165, 174, 241, 244, 246, 247
- Indra, 49, 50, 55, 92, 454–56, 505
- Indo-Iranian, 51–53, 55, 57, 82, 91, 134, 305–6, 369, 409–10, 450, 454–55, 473, 500, 505; and Abashevo culture, 501; and Balto-Slavic, 52, 101; and Greek, 55–56, 237, 369, 492; and Proto-Uralic, 94–95, 385; and Sintashta culture, 408–10, 435, 455–56, 503
- Iranian, Avestan languages, 31, 35, 51–52, 450, 454–56, 473
- iron metallurgy in the steppes, 334, 335, 336, 498
- Italic languages, 12, 14, 28, 53, 55–57, 64, 82, 91, 101, 134, 160, 305, 344, 367, 370, 495, 500
- Ivanov, V., 97, 473, 474, 476, 493, 495
- Ivanovskaya settlement, Russia, 165, 189, 199, 485
- javelins, 252, 257, 259, 374, 395, 396, 399, 400, 403, 405, 417, 462, 502
- Jones, Sir William, 6–8

- Kair Shak settlement, Russia, 142, 144, 149, 150, 158, 216  
 Kanesh tell, Turkey, 43–46, 403, 404, 413  
 Kara Khuduk settlement, Russia, 164, 170, 182, 186, 188, 266, 275, 276, 319, 493  
 Karagash kurgan, Kazakhstan, 308–9, 495  
 Karakol kurgan, Altai Mts. 308, 310, 496  
 Karanovo tell, Bulgaria: Eneolithic occupation, 163, 165, 172, 225, 226–27, 229, 238, 241, 254, 489; Neolithic occupation, 138, 146  
 Karnab tin mine, Uzbekistan, 414, 420, 423, 428, 431, 452, 504  
 Kartvelian languages, 97–99, 187, 477  
 Kelteminar culture, 388, 413, 419, 435, 501–4  
 Kemi-Oba culture, Crimea, 271, 283, 291, 298, 302, 321, 336, 339, 363, 398  
 Kérberos, 56  
 Kétegyháza kurgan, Hungary, 62, 221, 345, 348, 362  
 Khvalynsk culture, 62, 165, 181, 182–86, 216, 266, 297, 308, 318, 320; animal sacrifices, 62, 184, 185, 201, 237, 239, 474, 484; cemeteries, 182–84, 189, 190, 274, 319, 493; chronology, 168–69, 182, 213, 240, 266, 274, 275, 276, 482, 483, 484; copper metallurgy, 185, 484; diet, 186, 188, 191, 275; social hierarchy, 180, 185, 239, 254  
*Kikkuli*, horse trainer, 49  
 Konstantinovka settlement, Ukraine, 268, 274, 283, 296–98, 319  
*Korios*, or *Männerbünde* war bands, 364–65, 410, 499  
 Kozhai 1 settlement, Kazakhstan, 218  
 Krasnosamarskoe settlement and kurgan cemetery, Russia, 316, 329, 330, 331, 332, 410–11, 422, 436, 438, 449, 440, 504  
 Krivoe Ozero kurgan cemetery, Russia, 375, 376, 390, 391, 395, 399, 402, 425, 428, 429, 441, 447, 502  
 Kugat settlement, Russia, 144, 149, 150  
 Kurgan culture. *See also* Yamnaya horizon, 306–7, 495  
 Kuzmina, Elena, 235, 384, 429, 484, 485, 488, 502, 503, 504, 505  
 Kuznetsov, Pavel F., 333, 434, 496, 498, 505  
 language borrowing: areal borrowing, 88, 97, 475; in core vocabulary, 40–42, 472, 473; and creole languages, 16, 87, 476; in other domains, 15–16, 23, 41, 57, 77, 86–88, 93–98, 99, 476; in place-names, 88, 476  
 language change (or evolution), 22–27, 79, 117; sound change, 13, 23, 24, 25, 26, 29, 31; speed of, or glottochronology, 39–42  
 language shift (or adoption): causes, 117–20, 340–41, 492, 498; prehistoric, 258–59, 340–43, 365–68  
 Latin language, 7, 13, 23, 26–28, 31, 40, 55, 303, 462, 476, 495  
 Lehman, Winfrid, 21  
 Levine, Marsha, 201, 205, 206, 214, 215, 217, 218, 219, 240, 483, 485, 486, 487, 500, 501  
 Linear B inscriptions, 32, 49  
 Linear Pottery culture, 78, 104, 105, 141, 154, 164, 166, 187, 471, 481, 490  
 Lohne-Züschen tomb, Germany, 67, 69, 74  
 maces and mace-heads, 160, 180, 182, 183, 185, 186, 188, 191, 222, 234–35, 239, 251, 252, 254–57, 259, 275, 298, 333, 372, 395, 400, 460, 489, 491, 498, 505  
 Maidanets'ke settlement, Ukraine, 266, 268, 278, 280, 493  
 Maikop culture, North Caucasus, 84, 98, 263, 283, 287 ff., 302, 307; chronology, 266, 269, 270, 274, 290–91, 294, 494; graves, 287–92, 494 horses, 221, 291, 298, 494; language, 98, 297; metals, 273, 288–89, 291–92, 294, 298; origins, 187, 263, 285–87, 494; and southern civilizations, 284, 287–90, 293–95, 388, 420, 494; and steppe cultures, 263–64, 267, 270, 273, 274, 287, 295–99, 312, 319, 329, 353–54, 461, 492, 494, 498, 499  
 Mallory, Jim, 22, 80, 83, 118, 214, 311, 328, 329, 338, 370, 458, 471, 473, 475, 478, 479, 490, 495, 497, 498, 505  
 Malyan tell, Iran (ancient Anshan) 196, 283, 413, 414, 416, 417, 418, 433, 454, 503  
 Mariupol cemetery, Ukraine, 165, 179, 180, 181, 187, 216, 241, 247, 267, 483–84  
 matrilineality. *See* gender and power  
 Matveev Kurgan settlement, Ukraine, 142, 144, 149, 199, 216, 481–82, 484  
 Melchert, Craig, 46, 48, 472, 473  
 Middle Dnieper culture, 277–79, 344, 347, 348, 351, 354, 368, 377–81, 413, 500  
 migration, 17, 73, 140, 213, 214, 215, 307–8, 322, 366, 433, 439, 443, 458, 478, 501; causes, 110–11, 255, 364; charter groups, 112–13, 478; chain migration, 112–13, 117, 138; effects on language, 75, 78, 80,

- 100, 106–7, 109, 112, 117–19, 146–47, 259, 264, 311, 361, 365, 367, 369, 380; effects on material culture, 109, 112–13, 365, 498; elite group migrations, 251, 255, 256, 295; folk migrations, 108, 111, 119, 146, 232, 305, 307, 344, 361, 480
- Mikhailovka I Late Eneolithic culture, Ukraine, 266, 268–71, 279, 281, 283, 287, 291, 339, 349, 492, 493, 496
- Mikhailovka II Early Bronze Age settlement, Ukraine, 266, 302, 320–21, 324, 353, 371, 492, 496
- Mitanni kingdom, Syria, 49–50, 403, 454
- Mokhrablu settlement, Armenia, 221, 298
- Moliukhor Bugor settlement, Ukraine, 216, 241, 242, 244, 247–48, 268, 273, 277, 491
- $^{15}\text{N}$  in human bone, 127, 168, 169, 175, 176, 182, 186, 291, 330, 334, 406, 467–70, 482, 483, 484, 494, 495
- Nalchik cemeteries, Russia: Early Bronze Age kurgan, 283, 291, 294, 302, 339; Eneolithic cemetery, 165, 186–87, 188, 190, 268, 285, 484
- Nichols, Johanna, 96, 98, 116, 458, 472, 475, 476, 477, 478, 480
- Nikol'skoe cemetery, Ukraine, 168, 176, 178–80, 181, 182, 201, 254, 448, 483
- nomads and nomadic pastoralism, 60, 135, 236–37, 254, 321–22, 327, 393, 443, 459, 460–61, 489, 491, 496, 504
- Novosvobodnaya kurgan cemetery, Russia, 62, 63, 69, 268, 282, 290–92, 294–99, 302, 312, 317, 319, 332, 336, 339, 354, 356, 474, 494, 496, 497
- Nuer pastoralists, Africa, 110–11, 317, 478
- oaths in Indo-European, 191, 259, 342
- Old Europe, 132–33, 162, 174, 185, 214, 225–30, 234–37, 240, 244, 251, 255, 258, 460, 482, 488, 490
- Olsen, Sandra, 218, 219, 220, 485, 486, 487
- Ostannii kurgan, Russia, 71, 74, 302, 313, 316
- Pathan tribe and language shift, 118, 119, 259, 366, 478, 492
- patrilineality. *See* gender and power
- Persian language, 6, 9, 12, 51
- Peschanyi Dol herding camps, Russia, 325, 423, 437, 438
- Petrovka culture, Middle Bronze Age, Russia, 390, 397, 399, 400, 413, 428–31, 433, 441–43, 444, 446–50, 455–56, 462, 502, 504
- Phrygian language, 13, 34, 52, 53, 57, 369, 411
- Plachidol kurgan, Bulgaria, 338, 345, 348, 361, 362, 364, 365, 499
- poetry in Indo-European, 55, 56, 118, 135, 265, 331, 343, 405, 409, 410, 462, 479
- Pokrovka phase of the Late Bronze Age, Russia, 422–23, 437, 439, 488, 496, 504
- Polivanov Yar settlement, Ukraine, 226, 229, 241, 489, 493
- Poltavka culture, Middle Bronze Age, Russia, 306, 316, 326, 327, 329–31, 334, 335, 374, 379, 383, 386–87, 389, 390, 395, 440, 497, 501, 504
- Post-Mariupol culture, Ukraine, 267, 271–73, 274, 279, 287, 321, 336, 493, 498
- Potapovka culture, Middle Bronze Age, Russia, 327, 375–77, 382, 386, 390, 396, 401, 402, 409–10, 433–34, 435, 437, 440, 469, 501, 504
- praise of the gift, 118, 331, 343
- Proto-Indo-European language, 5, 8–11, 12, 14–15, 17, 19, 46, 75, 99, 115, 160, 186, 191, 238, 259, 277, 297, 300–306, 311, 317, 328, 331, 342, 360, 368, 461, 471, 473, 476, 495; beginning date, 59, 63–72, 77–81, 99; cladistic analyses of, 56–58, 77; homeland, 83–91, 93–99, 105, 132; link to Caucasian, 97–98; link to Proto-Uralic, 93–97; phases within, 43, 48, 56, 77; reconstruction of, 21–33, 35, 38, 42; religion in, 134–35, 364, 410; terminal date, 39, 42, 46, 50–52, 99
- race, 5, 8–9, 10, 11, 463, 475
- radiocarbon dating, 66, 126–28, 175, 290, 330, 458, 467–70
- Rakushechni Yar settlement, Ukraine, 142, 144, 149, 158, 165, 169, 188, 480, 481, 482
- Rassamakin, Y., 240, 242, 271, 272, 483, 484, 489, 490, 491, 492, 493, 494, 498
- Razdorskoe settlement, Russia, 274, 301, 484, 493
- Renfrew, Colin, 75–81, 97, 118, 464, 470, 472, 474, 476, 478, 480, 488, 500, 504
- Repin Late Eneolithic culture, Russia, 266, 267, 268, 274–77, 283, 297, 302, 305, 307–9, 310, 317–20, 324–25, 483, 493, 495, 496
- Rig Veda, 7, 9, 10, 11, 49–51, 56, 224, 342, 374, 402, 405, 408, 411, 454–56, 462, 466, 471, 473, 498, 500, 502, 505

- Ringe, Don, 56, 57, 65, 474, 476
- Romantic movement, 6
- Rostovka cemetery, Siberia, 413, 444, 436, 447, 504
- ruki* rule, 52, 55, 56
- Samara Early Eneolithic culture, Russia, 189, 190, 484
- Samara Valley Project, 316, 325, 437, 459, 497, 504
- Samsonovka settlement, Ukraine, 149, 302, 324
- Sanskrit language, 7, 9, 11, 18, 22, 29–30, 47, 64, 454–56; links with Sintashta culture, 408–10, 412; non-Indo-Iranian borrowed vocabulary, 11, 454–56, 505; Old Indic phase, 18, 31, 34, 36, 49–51, 57, 134, 160, 403, 408, 435, 454–56, 462, 473
- Sapir, Edward, 5
- Sarazm tell, Tajikistan, 283, 289, 308, 387–88, 393, 413–14, 419–21, 428, 430, 431, 433–34, 462, 501, 504
- satəm languages, 27–29, 52, 55, 56, 411, 472
- Schleicher, August, 21
- Scythians, 51, 103, 214, 215, 223, 321, 322, 329, 341, 440
- Sé Girdan tombs, Iran, 283, 294–95, 494
- secondary products revolution, 73–74, 262
- Seima-Turbino culture, 390, 413, 434, 443–48, 505
- Sergeivka settlement, Kazakhstan, 388–89, 390, 441, 501
- Shar-i Sokhta tell, Iran, 63, 413, 414
- Sherratt, Andrew, 73, 260, 298, 363, 471
- Shulaveri settlement, Georgia, 165, 186, 187
- Sintashta culture, Russia: animal sacrifices, 375, 405–8; cemeteries, 371, 407–8; chariots, 397–408, 417, 431, 462, 502; chronology, 374, 376–77, 441, 447, 502, 504; economy, 405–7, 440, 502, 503; fortified settlements, 371–73, 385, 390–91, 440, 505; link to Central Asia, 412, 417, 421, 427–35, 454–57; link to Indo-Iranian, 408–11, 412, 503; metals, 375, 383, 391–93, 395, 421, 443, 444; origins, 306, 382–83, 385–87, 389–93; sources, 500; weapons, 393–96
- Slavic languages, 13, 28, 52, 55, 57, 60, 64, 77, 82, 101, 259, 306, 307, 346, 348, 367, 368, 380, 476, 495, 500
- social hierarchy among steppe herders, 133, 154, 160–62, 178–82, 184–85, 191, 331–34, 341–43, 350–51, 355–59, 405–8
- Soroki settlements, Ukraine, 141, 144, 149, 151, 152, 266, 481
- sound change. *See* language change
- Spondylus* shell ornaments, 143, 147, 173, 181, 225, 228
- Sprachbund*. *See* language borrowing
- Sredni Stog I, Early Eneolithic settlement, Ukraine, 174, 176, 239, 240, 244
- Sredni Stog II, Late Eneolithic culture, Ukraine: cemeteries, 245–46, 258, 274; ceramics, 234, 240, 242, 244, 245, 286, 297, 491; chronology, 239–40, 241–44, 273–74, 483, 484, 490; origins, 240–47; relations with the North Caucasus, 286, 297, 319; relations with Old Europe, 234, 236–39, 240, 249–53, 258, 260, 264, 268, 269, 273, 277–79, 281, 348, 380, 489; role of horses, 202–4, 213, 214, 240, 247–49, 273–74, 488, 491, 498; settlements, 248, 249, 273, 274, 490, 491
- Subnaya culture, Russia, 436–441, 454; chronology and growth, 306, 410, 422–23, 433, 435, 437; copper mines, 441, 504; diet, 327, 439–40, 504; dog sacrifice, 410–11; graves, 323, 439; settlements, 322, 325, 437–39, 441
- Surskii Neolithic settlement, Ukraine, 142, 144, 149, 155, 174, 175, 483
- Suvorovo–Novodanilovka complex, Ukraine and Danube, 228, 230, 237, 241, 244, 245, 249–59, 261, 263, 271, 286, 287, 460, 461, 491, 492; and Anatolian languages, 259, 262; and Bolgrad culture, 255–56; copper objects, 250–52, 253–54, 491, 492; at Csongrad, 241, 252, 255; at Decea Mureşului, 235, 241, 250, 254, 255; kurgan graves, 252–53, 256–58; and the North Caucasus, 263, 286; and horse-head maces, 234–35, 254
- Svobodnoe settlement, North Caucasus, 62, 241, 243, 252, 258, 268, 269, 285–87, 474, 494
- Swadesh, Morris, 40–41, 472
- S'yezzhe cemetery, Russia, 165, 182, 189–91, 201, 216, 484
- Tarim Basin, China, 55, 65, 308, 311, 456
- Tashkovo II settlement, Russia, 389, 390, 413, 444

- Telegin, D.Y., 174, 178, 180, 181, 213, 215, 235, 240, 242, 244, 246, 249, 251, 297, 314, 317, 318, 319, 321, 330, 338, 480, 481, 483, 484, 487, 489, 490, 491, 492, 496, 498, 499, 500
- Three Age system, 123–24, 125–26, 130, 161, 290, 479
- tin trade, 124, 391, 413, 417, 418–21, 425, 428, 443–46, 447, 450, 452, 456, 460, 462, 503, 504
- Tocharian languages, 13, 14, 28, 34, 54, 55, 56, 57, 64–65, 77, 82, 101, 191, 264, 265, 305, 307, 311, 342, 344, 490, 496
- tree diagrams, 56, 57, 100, 348, 471
- Trichterbecker (TRB) culture, Poland, 67, 247, 262, 348, 360, 367–68, 494
- Trito* myth, 134, 239, 364
- Troy citadel, Turkey, 45, 69, 262, 290, 336, 338, 354–55, 473, 497
- Tugai settlement, Uzbekistan, 388, 413, 414, 428–33, 452, 455, 504
- turquoise trade, 263, 283, 289, 294, 295, 388, 419–20, 421, 425, 452, 490
- Ur III kingdom, 403, 413, 414–17, 421, 427, 431, 502
- Uralic languages, 80, 93–96, 98, 99, 385, 476
- Uruk, Iraq, 62, 263, 282–84, 289–90, 294, 298, 322, 493, 495; and invention of the wheel, 66–67, 74, 282; and wool, 61–62, 474
- Usatovo culture, Ukraine, 349–60; ceramics, 351–354; chronology, 347–48; economy, 351–53, 354–55; glass beads, 354; graves, 350, 355–59; metals, 354–55; social organization, 350–51, 355–59
- Varfolomievka settlement, Russia, 142, 144, 158, 165, 170, 180, 182, 186, 188, 189, 191, 199, 201, 214, 216, 234, 254, 481, 483, 484
- Varna cemetery, Bulgaria, 163, 165, 185, 225–27, 229, 235, 238, 243, 256, 257, 258, 361, 362, 363, 488, 491
- Vasiliev, Igor B., 182, 190, 276, 335, 434, 480, 481, 483, 484, 485, 487, 493, 496, 497
- Vehik, Susan, 255, 393, 488, 490, 491, 502
- Verethraghna*, god of victory, 454, 505
- Vinogradov, Nikolai, 394, 399, 429, 500, 501, 502, 504
- Volosovo forager culture, Russia, 380, 382, 385, 390, 501
- warfare, 18, 119, 137, 222–24, 488, 491, 502; in the Abashevo culture, 383, 385; in the BMAC, 454, 462; in the end of Old Europe, 228, 230, 237–39, 249, 255, 258–60, 281, 489, 493; in the Sintashta culture, 391, 393–405; in Ur III 417, 503; in the Yamnaya horizon, 342, 364–65, 342, 499
- wheels, 6, 59, 459; on battle wagons in Mesopotamia, 417–18; invention and diffusion of, 65–75, 133, 282, 284, 287, 291, 295, 297, 317, 385, 475, 503; Proto-Indo-European terms for, 33–36, 63–65, 78, 81, 100, 474, 475; significance of, 7 2–73, 81, 302, 459, 461, 500; spoked, 372, 374, 397, 399, 402–4, 459; in wagon graves, 69–72, 295, 312, 332, 362–63, 425, 427, 496
- wine, 236, 495
- Wolf, Eric, 106–8, 477, 478, 479
- wool, 15, 59–63, 66, 73, 81, 91, 98, 137, 175, 261, 263, 264, 269, 282, 284, 285, 292, 294, 298, 351, 456, 471, 474, 492, 493
- Yamnaya horizon, Ukraine and Russia, 133, 299, 300ff.; cemeteries in, 280–81, 303, 304, 309, 319, 329–30, 332, 336–39; chronology of, 272, 275, 306, 314–16, 321, 493, 496; east-west differences in, 304–5, 320, 324, 386; economy of, 312–17, 320–28, 440, 497; metals in, 311, 334–36, 497; origins of, 275, 299, 300–303, 317–19, 496; settlements in, 304, 320, 324, 325; social organization in, 303–4, 317, 328–29, 331–34, 341–43, 364–65, 459, 492, 495, 497; wagon graves in, 69–73, 311–17, 332, 362–64, 496
- Yamnaya migrations, 305–6, 312–17, 320–28, 325, 340ff., 364–65, 461; to the Altai Mts., 307–11; to the Danube valley, 361–65, 499; to the middle Dnieper, 375, 377, 380, 500; to the Tripolye region, 280, 343–48, 359–60, 367–68, 498
- Yasinovatka cemetery, Ukraine, 165, 169, 175, 179, 180–82, 189, 483
- Zarathustra, 51, 408, 473
- Zeder, Melinda, 195, 196, 416, 485, 503
- Zeus, 31, 262
- Zvelebil, Marek, 153, 475, 477, 480, 481, 483