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Multiple Approaches: Changing Identities on the Hungarian Plain During the Early to Middle Copper Age

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Recent headlines suggested an ever-widening gap may threaten anthropology as a holistic discipline. Fresh wounds were reopened once again as the American Anthropological Association (AAA) removed the word "science" from its long range plan, replacing it with "public understanding of humankind" (Wade 2010a:A16). Outcry from many anthropologists may have led to a subsequent revision by the AAA Executive board, which acknowledges "the crucial place of the scientific method in much anthropological research" (Kuper and Marks 2011; Wade 2010b:A25). While this controversy may stem from simple misunderstandings of the AAA's position, the controversy highlighted some of the divisions in the discipline (Kuper and Marks 2011).

These recent debates are a symptom of a problem: unity between each of the four subfields of anthropology. Many of the fields utilize a traditional scientific approach (biological anthropology or archaeology), while others draw upon both scientific and humanistic approaches (cultural anthropology). Some individuals in each of these anthropological subfields question the necessity of learning the perspectives of the other fields. Yet despite these divides, even the controversial AAA position now states that anthropology seeks "to understand the full sweep and complexity of cultures across all of human history" and "anthropology draws and builds upon knowledge from the social and biological sciences as well as the humanities and physical sciences" (AAA 2010). I wholeheartedly agree with the revised perspective of the AAA. I argue that a holistic research project draws upon perspectives from many anthropological disciplines. Archaeological interpretations of the material record and most physical anthropological interpretations are based on cultural anthropological data, concepts, and theories. In this paper, I utilize concepts drawn from cultural anthropology, archaeology, and biological anthropology to design a research methodology to study prehistoric social relations on the Hungarian Plain. This project makes clear that each subfield's perspectives and methods are necessary to gain an understanding of the interactions of people during the dynamic European Copper Age.

Examining Identities: Multiple Perspectives

A potential interdisciplinary bridge lies in the study of construction of identity in prehistory. Identity is a complex issue, but might be comfortably defined as "people's perceptions of themselves and how they relate to larger social phenomena that characterize their existence" (Knudson and Stojanowski 2009:1). Identity, which encompasses mind, body, and materials, can best be studied using multiple analytical approaches on many different types of data. Researchers must study the specific contexts in which archaeological items were used to truly understand how artifacts could represent or be employed to renegotiate social statuses (Laneri 2007). Many archaeological perspectives on these contexts are drawn from cultural anthropological research. Mortuary ritual is ideal for study as an individual's social relations and materials are brought together in a ritual of remembrance and a revival of cultural values (Parker Pearson 1999). Burial allows for the combination of many approaches as individuals and artifacts are recovered. Bodies can be studied using bioarchaeological methods to nuance understanding of how an individual related to others. Bioarchaeologists can conduct studies of pathology, stress markers, diet, genetics, and bone chemistry to interpret human behaviors from bodies and augment hypotheses about human social differentiation, migration, and social structure (for review see Katezenberg and Saunders 2008; Larsen 1997). Finally, archaeology's perspective on time can be used to understand how societal changes affected how individuals viewed themselves and others long term.

Archaeologists have long been interested in how burial communicates ideology and social networks. Extensive ethnographic information has demonstrated that burial treatment is not a direct representation of the individual's activities, but can still be a useful avenue towards the discovery of relations between individuals (Carr 1995). Mortuary treatment, as ritual, is steeped in meaning and serves to revive and renegotiate a culture's values (Bloch and Perry 1982; Carr 1995; Laneri 2007; Rappaport 1999). Many useful multifaceted perspectives on burial have been drawn from gender-based archaeology, which itself draws on a deep understanding of social-cultural relations between individuals (Arnold and Wicker 2001; Gilchrist 1999; Moore and Scott 1997; Nelson 2002, 2004, 2007a,b). Gender is a socially constructed phenomenon based upon performances, and often has material correlates (Butler 1990; Brettell and Sargent 1993; Strathern 1988). These performances and materials then reflexively become aspects of gender themselves that appear as consistent representations in artifacts, artwork, and cultural practices (Butler 1990). European literature has many examples of gender-based approaches that deal with making the difficult connections between artifacts and social statuses (Whitehouse 2007 for summary and Arnold 1991, 1996, 2002, 2007; Derevenski 1997, 2000; O'Shea 1995, 1996; Rega 1997, 2000; Robb 1994a,b; Stoodley 1999, 2000).

For example, in Copper Age Hungary, burial appears to be a major arena for the performance of gender ideology. At the Middle Copper Age site of Gyula 114, individuals buried on their left side are associated with beads, shells, and pebbles and individuals buried on their right side were accompanied by copper pins and flint artifacts (Gyucha et al. 2000, Pawn 2008). Biological sex estimates indicate that individuals buried on their left side were female and males were buried on their right side (Pawn 2008). Further, Derevenski (1997, 2000) recognized significant correlations between age, gender and grave goods at the Early and Middle Copper Age cemetery of Tiszapolgár-Basatanya. Like Gyula 114, males tended to be buried on their right side and females on their left – a pattern that generally holds on the entire Hungarian Plain. Worked stone artifacts correlated almost exclusively with right-sided graves of individuals aged over 25 years. Arm rings, also restricted to right side burials, were present only in graves of individuals aged from 5-25 years (Derevenski 1997). Derevenski's examples illustrated that grave goods and body position were good markers for the expression of gender, but detailed research must move behind the material components to reconstruct relations of communities and individuals.

A more nuanced understanding of identity might be possible using biological techniques to supplement archaeological techniques and cultural models. Most researchers focus on the differentiations in grave goods and burial treatment, but they generally fail to probe the underlying social relations of these rituals. Accurate sex and age estimates, of course, are vital for understanding how identity might have been constructed by giving us a sort of "baseline" for interpretations of the material record. Stable isotopes have long been used show mobility and diet (see Katzenburg 2008; Larsen 1997 for brief review). In the case of Copper Age Hungary, strontium isotope studies were used in conjunction with settlement patterns and material distributions to indicate changes in the way social networks may have operated, while residential mobility increased (Giblin 2009). Biological distance and genetic studies on cranial and dental traits have proved useful as they revealed differences within and between groups of individuals buried in cemeteries – differences in social relationships that are not necessarily apparent from examination of burial treatment. Genetic studies, if correlated with differences in mortuary treatment, can show kin groups and colonizing populations. Conversely, researchers can also discover that culturally homogenous burial groups were composed of individuals from a variety of biological populations, leading to new hypotheses about the adoption and construction of ethnicity and identity. Archaeologists should search for differences in genetics to augment hypothesis about the social processes that produce variation in cemeteries.

Biological distance studies, in the most basic sense, measure the degree of genetic affinity between groups of individuals (Hillson 1996, 2005; Larsen 1997; Rhoads 2002; Scherer et al. 2004; Schnutenhaus and Rösing 1998; Sciulli 1979, 1998; Stojanowski 2001, 2003; Stojanowski and Schillaci 2006). Biological distance analysis assumes that certain morphological traits have a strong genetic basis, and that these traits are all represented at different loci (Hallgrimsson et al. 2004). Genetic inheritance creates specific suites of these traits in populations and individuals exhibiting high frequencies of similar suites of traits can be said to have close biological affinity (Hillson 1996, 2005; Larsen 1997). A further assumption is that these discrete traits are mostly unaffected by environment and that variability and similarity are the result of shared ancestry, natural selection, gene flow, and genetic drift (Mielke et al. 2006). Frequencies of traits are measured within two or more populations and then population pairs are analyzed using a mean measure of divergence statistic or pseudo-Mahalanobis distance (Konigsberg 1990; Harris and Sjøvold 2004) where a resulting statistic close to zero represents populations with very similar genetic characteristics (Guatelli-Steinberg et al. 2001; Hallgrimsson et al. 2004; Ullinger et al. 2005).

Biological distances have been useful in examining issues of social interaction such as biological affinity (Guatelli-Steinberg et al. 2001; Hallgrimsson et al. 2004), migration (Blom et al. 1998; Ero¬lu and Erdal 2008; Matsumura 2001), post-marital residence (Schillaci and Stojanowski 2002; Stojanowski and Schillaci 2006), phenotypic variance (Key and Jantz 1990a,b; Stojanowski 2001, 2003), level of interaction (Tartarek and Sciulli 2000), and kinship (Alt et al. 1996, 1997; Alt and Vach 1991, 1998; Vach and Alt 1993). One could look at whether or not individuals in a cemetery might be closely related, such as kin groups, or whether a cemetery might include many individuals from a wide range of genetic backgrounds or different communities of origin. The genetic composition of cemetery populations can illuminate the particulars of human social relations if approached with rigorous hypotheses that incorporate material culture. For example, archaeologists tested colonization models for southern Peru during the first half of the 2nd millennium AD (Blom et al. 1998). During 500 BC-500 AD, elements of the Tiwanaku culture of Lake Titicaca (burial, settlement pattern, material culture, ritual) appeared in the Moquegua valley at sites such as Chen Chen (Blom et al. 1998:242-243). Researchers hypothesized that these elements represented a group of Tiwanaku colonizers as opposed to the incorporation of Moquegua locals into the Tiwanaku lifestyle. If the hypotheses were correct, then the settling groups would show closer biological distance to earlier *altiplano* Tiwanaku sites, rather than pre-Tiwanaku Moquegua valley groups. Results indicated that populations at Tiwanaku-affiliated sites such as Chen Chen and Omo were biologically closer to Tiwanaku *altiplano* site populations than pre-Tiwanaku sites in the Moquegua valley (Blom et al. 1998:253-255). The Moquegua valley example shows that biological distance can be used to further test archaeological assumptions based on material culture and can nuance ideas about how ethnic identity was shared.

From a practical perspective, biological distance studies are non-destructive, produce robust data sets, and can be used for multiple analyses of the same sample – an advantage over other types of biological analyses, such as ancient DNA and stable isotopes. These distance studies could augment many current models about changes in social relations proposed for the European Copper Age. As the above example illustrated, regional level projects are ideal for biological distance studies, since several populations are compared and contrasted culturally as well as biologically. In order to examine some of the social processes during the European Copper Age, I propose a study of the Early-Middle Copper Age (4500-3500 BC) on the Hungarian Plain.

Archaeology of the Hungarian Plain: The Early Copper Age Tiszapolgár culture (~4500-4000 BC)

The Tiszapolgár culture was characterized by major changes in settlement pattern, site distribution, mortuary treatment, and scale of interaction relative to the Tisza/Herpály/Csőszhalom complex of the preceding Late Neolithic (Bognar-Kutzián 1963, 1972; Duwe 2005, Gyucha and Parkinson 2008; Gyucha et al. 2006, 2009; Parkinson et al. 2004, Parkinson 2006a, b). Most sites tended to be smaller, which is in stark contrast to the aggregated tells and large "flat" sites of the Late Neolithic (Chapman 1994a; Hegedűs 1977; Hegedűs and Makkay 1987; Parkinson 2006a). The Tiszapolgár culture extended across most of the Hungarian Plain and further into Transylvania and Slovakia (Parkinson 2006a; Parkinson et al. 2010; Yerkes et al. 2009). The relative homogeneity of the material culture over a larger geographic area probably indicates a greater scale of integration or interaction between settlements (Parkinson 2006b). Many more sites spread across the landscape may indicate either population dispersal, increased mobility, or both (Giblin 2009; Parkinson et al. 2004, 2010; Parkinson 2006a,b). A recent stable isotope analysis in the Körös region showed that strontium variability in individuals from Early Copper Age cemeteries was greater than the levels in Late Neolithic burials (Giblin 2009). This may be the result of greater residential mobility during the Early Copper Age.

Mortuary behavior changed dramatically. While Late Neolithic burials tended to be associated with settlements and contained few grave goods, many Early Copper Age burials were found in cemeteries located away from settlements and some contained many grave goods. Mortuary items and body positioning have been used to indicate the gender, age, and identity of the deceased (Chapman 2000a; Derevenski 1997, 2000; Meisenheimer 1989; Parkinson 2006a; Siklósi 2004; Skomal 1983).

Based on the settlement and cemetery data, the distributions of certain types of cultural materials were not uniform during the Early Copper Age. It is suggested that exchange networks linking the Great Hungarian Plain with northern Hungary became dominant and there was a general decrease in the frequency of contacts with the central and southern plains (Gyucha et al. 2009). On parts of the Great Hungarian Plain, flint and obsidian from northern Hungary are found in many Early Copper Age assemblages – Volhynian flints from Poland and the Ukraine became preeminent in Early Copper Age assemblages across the entire plain (Biró 1998). Little, if any, lithic material seems to originate from southern sources, but it must be remembered that Early Copper Age lithic assemblages are much smaller than Late Neolithic assemblages. Copper sources exist in Transylvania and northern Hungary, but copper may also have been obtained from the south (Siklósi 2004). However, most of the recovered copper artifacts were found in Copper Age cemeteries in the northern portion of the Great Hungarian Plain. Very few copper tools have been found in domestic or mortuary contexts elsewhere on the Plain (Bognar-Kutzian 1963; Kovács and Váczi 2007). Gold is extremely rare, with a total of 5-6 kg for the entirety of the Copper Age Tiszapolgár and Bodrogkerestúr cultures despite the proximity of the Carpathian sources (Makkay 1993). Ceramics became a localized commodity, with little evidence for the importation of much ceramic material during this period. The abandonment of most nucleated Neolithic tell settlements and the dispersal to many scattered small Copper Age settlements may have resulted in a switch to a down-the-line exchange system (Gyucha et al. 2009), resulting in uneven distributions of artifacts across the Great Hungarian Plain.

Middle Copper Age Bodrogkerestúr culture (~4000-3500 BC)

In many important ways, the Middle Copper Age (MCA) Bodrogkerestúr culture was a continuation of the Early Copper Age (ECA) Tiszapolgár culture (Parkinson 2006a). Many sites were inhabited continuously from the ECA into the MCA and there was considerable overlap in radiocarbon dates (Yerkes et al. 2009). Few differences existed in settlement organization and type; and, similar material culture was utilized with minor changes in ceramic types. Sherratt (1997a) argued for a reduction in settlement of the central Plain that may have indicated a shift towards resources available at the edges. Additionally, there was some expansion into previously uninhabited areas between the Tisza and Danube rivers. Some settlements had features indicating the resumption of contact with other regions, including a Lengyel style roundel at Szarvas 38 and a subterranean pit house reminiscent of the Yamnaya culture of the European steppe region

(Ecsedy 1979; Makkay 1983, 1986, 2007). Relatively little else is known about MCA settlements and cemeteries; therefore, they are the key sources of data. According to Skomal (1983), variations in the types of grave goods and body positioning became less variable by the MCA. Copper artifacts tended to be larger than during the ECA, especially the copper axes associated with males.

Understanding the Copper Age

The burial patterns of the ECA and MCA on the Great Hungarian Plain are "typical" of the patterns identified at most European Copper Age cemeteries and burial sites. This has led some to suggest that there was an increase in social differentiation (for Bulgaria, see Bailey 2000; Chapman 2000a; Todorova 1995; Todorova and Vajsov 1993; for Serbia, see Borić 1996; for Spain, see R. Chapman 1990, 2003; for Italy, see Dolfini 2006). Models for the increases in social differentiation during the Copper Age have often proposed transformations of social networks and trade-exchange relations. Most researchers have suggested that changes in the nature of settlement, trade, and materials might have produced considerable renegotiation of conflicting identities and that these conflicts appeared in mortuary treatment. Often, these models have drawn heavily from ethnographic accounts of the use of material culture to create or modify social relations.

One model popularized by Andrew Sherratt and others states that social differentiation might result from increasing economic specialization integrated into a regional exchange system and the growing value of non-perishable items that could be converted to social relations and food (Halstead 1981; Halstead and O'Shea 1982, 1989; O'Shea 1981; Parkinson 2006b; Ruiz-Galvez 1993; Sherratt 1997b,c,d,e; Sherratt and Sherratt 1991). Initial population increases during the Neolithic may have pushed some communities into areas that were less than desirable for food production. These marginalized communities began to specialize in the production of desired items that could be traded for food, giving non-food items social exchange value. Objects of value could also have been used in social agreements, as Melanesian ethnographic studies have indicated. In New Guinea, particularly well-crafted and exotic items (i.e. large stone axe blades) were appropriate for social contracts, such as bridewealth, death compensation, exchange value, and death payments (Chappell 1966; Strathern 1988). To explain how these objects take on value, Sherratt (1997d) made a distinction between areas of direct and indirect contact in which an object might move through several stops from its zone of production to its final owner. A key interaction was between the direct and indirect contact zones, where a considerable change in the value of the object happened. In zones of direct contact, exchange happened between close relatives, and material equivalence might not have been an issue in exchanges. However, as items moved into zones of indirect contact, they could not easily be exchanged for labor or services, and their perceived material value became an important consideration. Sherratt (1972) suggested that high value items might overcome this friction in exchanges between individuals from different local groups. Hence, the further from the source, that is, extending into the indirect contact zones, the less likely that goods could be exchanged for favors and the more likely that trade with value occurred. However, since the direct contact zone determined much of production, there was a key disarticulation between supply and demand. Items still needed to be exchanged, especially vital commodities which are needed in areas with less food production potential. A circulation of non-utilitarian items helped mobilize demand and these items could be accumulated or exchanged. Sherratt (1997d) called this a "fly wheel" that set prehistoric economies in motion. Accumulations of non-perishable items provided buffers against hard times, since they could be used whenever needed. But accumulation may also have led to differentiation between communities and individuals (Ruiz-Galvez 1993). Valuable items may have started a "flywheel" of trade as continued population increased and colonization of new lands heightened demand for more valued objects (Sherratt 1997d). The differentiation in burial treatment seen during the Copper Age might have represented "big man" systems (Sahlins 1963), where particular individuals or communities at nodes that had concentrations of circulating goods accumulated valuable display items. At the Tiszapolgár-Basatanya cemetery, large copper axes are associated with older males who may have gained considerable rank and acted to limit the exchange of these prestige items by insisting that they be placed in their graves (Sherratt 1997d).

An alternate model suggests that differentiation might have resulted from the value of the "exotic" and the negotiation of identity while exchange networks expanded. John Chapman (2000a,b, 2008; also see Chapman et al. 2006; Jones 2005) proposed that objects take on value because of their associations with specific people or social relationships. Chapman drew on the work of Miller (1985, 1987), suggesting that "human subjects externalize themselves in a creative act of differentiation and in turn re-appropriate this externalization through sublation" (Chapman 2000b:31). Much like Butler's (1990) work on gender performances, these externalized relations were then internalized, so that objects themselves took on a social existence beyond their owners and the social life of an individual becomes objectified. Objects then made the social relations justified and a reality external to internal ideas. Munn's (1978, 1985) work with the Gawa in Papua New Guinea showed that inter-group relations could be manipulated through the exchange of objects. Gawans placed themselves into objects to trade with others (self-alienation) and an aspect of themselves or another was returned in the exchange. From this ethnographic account, Chapman developed his idea of enchainment (1996, 2000a,b) where objects were created and carried aspects of the individual creator with them. Social relations then were defined through exchange. However, this process could be active, with individuals manipulating the social value of objects along the way. Once an object was exchanged and transferred to a new community, its value was renegotiated and reinterpreted. Notably, items obtained over long distances were exotic and could take on particular value in prehistoric exchange systems. Helms (1993) suggested that high craftsmanship, exhibited by the copper axes found in many burials, might also be valued. Burial was one instance where societies might have negotiated and renegotiated social identities and radical shifts may have resulted from the introduction of new contacts and material culture (Arnold 2007; Sørenson 2000, 2007). Chapman (1994,1997,2000a,b) suggested that cemeteries may have been one of Mann's (1986) so-called "arenas of social power" in which there was an intersection of a specific place (with function and meaning) and the social beings who have power to perform in these areas. The creation of a new arena of social power was often the result of a contradiction in social order, such as avenues of personal wealth accumulation in communal property settings or changing gender relations (Chapman 1994b). Thus burial treatment on the Copper Age Hungarian Plain may have been transformed as shifts in settlement pattern and trade networks introduced new goods such as gold and copper and the distributions of other objects changed.

While both of these models have strong supporting evidence, neither model is based upon rigorous application of regional data. To date, most studies have focused on two or three cemeteries and seem to require further explanation. While conflict of identity and changes in exchange networks might help explain the appearance of cemeteries and the elaboration of burial treatment, they do not adequately explain the specific patterns seen in these cemeteries. For example, neither of the above models suggested *why* particular patterns of gender and age distinction appear. A more rigorous study, using multiple lines of evidence, could elucidate the specific social relations that are expressed in mortuary ritual. It is helpful to drawn not only upon archaeological materials using cultural models, but to add biological data to look for patterns that might fit these models.

Preliminary Research

To further investigate these patterns, I have conducted studies of the Tiszapolgár-Basatanya, Gyula 114, and other Copper Age cemeteries. The focus was the identification of basic mortuary treatment. According to my research, Tiszapolgár-Basatanya (n=156) exhibited clear changes in the distribution of grave goods and burial treatment over time (Bognár-Kutzián 1963). For ECA female burials, 57% contained an item of copper, flint, or obsidian. Only one of the 20 male burials lacked such items. In contrast, only 23% of female MCA burials contained items of copper, obsidian, or flint and 36% of the female burials from the MCA contained only ceramic vessels. 27% of MCA male burials contained such items. Similar patterns existed at the much smaller MCA cemetery of Gyula 114 (n=18) located to the south, but there were some subtle differences (Gyucha et al. 2000; Pawn 2008). 12% of female burials contained a copper item, and 86% of male burials contained a copper item. Flint blades were restricted to male graves. When other cemeteries are examined, certain types of materials seem restricted to certain areas. While obsidian is more common at Tiszapolgár-Basatanya (24 pieces), it occurs in just a few instances at other cemeteries, such as Jászladány (1 piece) and not at all in cemeteries, such as Pusztaistvánháza (Bognár-Kutzián 1963; Hillebrand 1929; Patay 1945). Conversely, gold is rare at Tiszapolgár-Basatanya (1 piece over 156 graves), but occurs more commonly at Jászladány (seven pieces over 40 graves). Preliminary research indicates that there could be considerable variation in burial treatments across the Hungarian Plain over space and time.

Key questions remain. For example, are the larger more variable cemeteries, such as Tiszapolgár-Basatanya, representative of more regional level cemeteries, as opposed to local cemeteries? The variety of grave goods and burial positions at Tiszapolgár-Basatanya might suggest that it was an arena of social power, where individuals from many communities came together in ritual remembrance. Or, was identity constructed with different materials across the plain, but was essentially homogenous as suggested by many archaeologists? Biological techniques could shed light on these issues, but also could suggest models that account for the specific differences seen in these cemeteries.

Research Design

I have developed several research questions about mortuary treatment on the Hungarian Plain. In particular, these questions use biological distance to examine genetic relationships in hope that they may shed light on the patterns seen in the material record.

Research Question 1: What were the differences in mortuary treatment between and within cemeteries during the Hungarian Early-MCA? Were cemeteries local traditions or more regional phenomena? A starting point for my research will be an examination of regional variation in burial rituals. I hypothesize that cemeteries will vary in size and have diverse burial treatments, though many differences could be subtle. Differences in mortuary ritual could represent local and perhaps regional ideas about the construction of identity.

One interesting possibility is that some cemeteries might be regional and were utilized by several communities. If so, then regional cemeteries should have the following characteristics: (1) variety in grave goods and burial treatment exceed the variation seen at other cemeteries; and, (2) disparities in grave goods and burial treatments should be less marked in the south of the Plain if access to raw materials is a major factor in the formulation of regional, multi-community cemeteries. Previous archaeological evidence indicates variability in temporal extent, number of individuals and material content for Hungarian Plain cemeteries. If some burial areas are used by many communities with access to different materials and objects, then I expect these cemeteries to be larger and to have a more diverse set of grave goods and burial treatments. This is expected because individuals may have established new social networks, encountered different forms of material culture, and were presented with new ways to define themselves. One way these new identities may have been negotiated is through burial treatment.

Correlations between specific burial treatments and age-sex categories will not be as strong if a variety of mortuary rituals from different communities, as documented in other small cemeteries, were enacted. Over time, as individuals continued to interact at a regional level, burial treatments may have become less variable, as some have suggested for the MCA, but this remains to be verified (Skomal 1983). Diversity in burial treatment will be investigated using analyses of grave goods, body positioning and placement within the cemetery to understand how these variables vary with regard to age and sex. All cemeteries will be compared to determine whether patterns expressed in well studied cemeteries, such as Tiszapolgár-Basatanya, were truly regional in scope. Both gender and age cohorts might have characteristic sets of associated material culture and burial treatments, but there may be considerable variation within these categories.

Research question 2: What was the nature of biological variation during the Early-MCA and how does it compare to variation in mortuary treatment? I will analyze variation within and between cemeteries. Within cemeteries, trait frequencies may cluster in specific areas of cemeteries, indicating communities or kin groups. These kin groups may have associated sets of material culture and burial treatments. Chapman suggested that micro-tradition units of burials might represent social units at Tiszapolgár-Basatanya (2000b:79,83). A genetic comparison of these burial units might show genetically related individuals, and suggest that these micro-tradition units represented lineage groups.

Genetics and material culture differences *between* cemeteries could relate in a variety of ways. Similarities in genetically-linked traits could correlate with similarities in burial treatment across the Hungarian Plain. In this case, I would suggest that fluid social networks moved people and material culture allowing for the flow of both genes and ideas. This exchange of ideas, material culture, and human beings could result in similar constructions of identity expressed in burial. Over time, gene flow may reduce genetic variability as individuals interact culturally and biologically on a regional level and this process may help explain the reduction in variability in burial treatment during the MCA. Conversely, similarities in burial treatment could correlate with differences in the frequencies of genetically-linked traits. In this case, I would suggest that while gene flow was limited between local populations, cultural similarity was maintained through other means, such as extensive trade networks and ritual interaction at cemeteries. Also, genetically different individuals could be incorporated into communities through adoption or post-marital relocation. Another possibility is that increased variability in the frequencies of genetically-linked traits may correlate with increased variability in burial treatments – individuals from different genetic backgrounds utilized the same cemeteries, displaying a variety of local traditions and material culture. Some cemeteries exhibit local mortuary traditions as well and show limited genetic interaction with other populations. Different types of correlations between genetic and mortuary variability can lead to the above hypothesis about the nature of social interactions between individuals and communities.

One method for comparing variances in skeletal traits is to calculate a multivariate covariance matrix determinant (Key and Jantz 1990a,b; Stojanowski and Schillaci 2006). Covariance matrix determinants could be compared in ratios of one cemetery to another. Ratio scores would indicate which cemetery has a higher genetic variance. Another form of comparison would be to calculate the genetic distance between cemeteries using Mahalanobis distance and MMD statistics (Irish and Konigsberg 2007; Konigsberg 1990). These distance statistics can indicate if populations have close genetic relations, and can put these differences in perspective.

Research Question 3: What are the genetic differences between males and females and how might they relate to gender differentiation in burial treatment? Previous research suggests that clear differences exist between genders in Hungarian Plain cemeteries (Derevenski 1997, 2000). Possible reasons that differences developed in burial treatment were that changes in settlement and exchange were accompanied by changes in post-marital residence, or a broadening of the base population for mate exchange. If these changes occurred, then one sex would exhibit higher genetic variability within a cemetery.

For comparisons within a cemetery, I would compare males and females using the distance statistics or comparisons of variance, such as F_{st} statistics, Levene's tests, or covariance matrix determinants (Konigsberg 1987, 1988, 1990; Konigsberg and Buikstra 1995; Key and Jantz 1990a,b; Relethford et al. 1997; Stojanowski and Schillaci

2006). If one sex has greater residential mobility, then the following would be indicated by the data (Stojanowski and Schillaci 2006): (1) comparison between the sexes would indicate heterogeneity (higher biological distance), since males and females would be unrelated; (2) the mobile sex might be relatively homogeneous, as this sex is likely from a limited network of sources, but have greater variance due to greater migration of mostly unrelated individuals; and, (3) inter-cemetery comparisons of the non-mobile sex would indicate heterogeneity, as they would be isolated, would eventually diverge genetically, and were not subject to gene flow homogenization. Genetic variability between sexes could be compared to gender differences in burial to gain further insight on how residential mobility might have affected mortuary rituals.

Sample

To research the above topics, I will utilize data from both published sources and archaeological collections. The sample includes seven sites grouped into a geographical region – the Hungarian Plain. Figure 1 indicates the approximate locations of these sites. They were selected to provide a sample of both ECA and MCA localities from both regions. This provides time depth to the project and a means of comparison with other periods such as the Late Neolithic. Some scholars have argued that it is difficult to distinguish the MCA from the ECA, but if they are viewed as temporal phases of the same culture, detailed analysis is still possible. While this project does not focus on settlements, some burials did occur within habitation sites during this period (Parkinson 2006a,b; Parkinson et al. 2004, 2010; Giblin 2009; Whittle 1996, 2003; Yerkes et al. 2007). A relatively small portion of the Copper Age skeletal sample is found within settlements, but I have included Vésztő-Mágor in the sample to provide contrast and

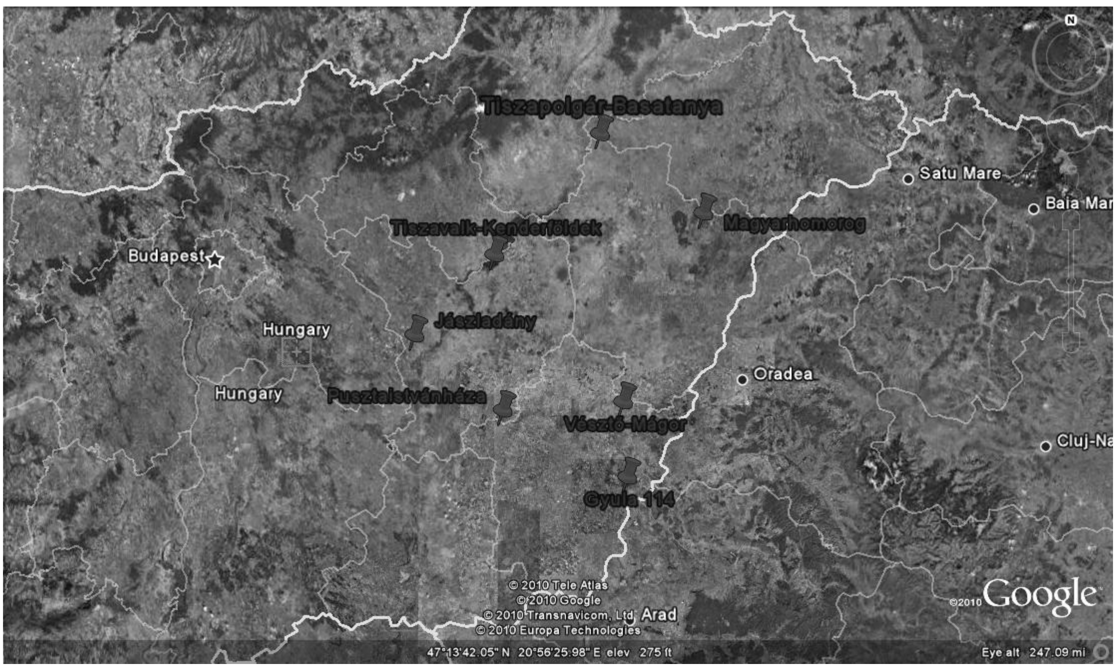

Figure 1: Approximate locations of Project Sites on Hungarian Plain

additional detail on types of burial traditions in the region. All Vésztő-Mágor burials were found between or under houses within the site (Whittle 2003).

Data Collection

One goal of this project is to examine regional variability in burial treatment on the Hungarian Plain. Based upon the work of other researchers in the region (Chapman 1997; Derevenski 1997, 2000; Parkinson 2006a), I will measure the following variables for each individual: age, sex, leg flexion, body position, and grave goods. Age appears to factor into gender categories in Copper Age Hungary; identification of these categories involves estimations of age based on cranial and postcranial maturation and deterioration (Buikstra and Ubelaker 1994; Derevenski 1997, 2000). I will use the following generalized age cohorts: infant, subadult, young adult, middle adult, and older adult. These age categories must necessarily be based upon the sample and will be adjusted as analysis proceeds. The identification of sex gives a greater understanding of gender categories as certain individuals exhibit "female" gender patterns but are biologically male, or vice versa (Derevenski 1997).

Grave goods will be measured and recorded in the following ways: number, weight, dimensions, type, material, and percentage of grave inventory. Extremely fragmentary items, such as broken ceramics, will be measured using all possible variables, or I will rely on published reports which often contain dimensions of such objects taken at the time of excavation.

I will record characteristic non-metric traits for the dentition and cranium (Irish and Konigsberg 2007; Larsen 1997; Scott and Turner 1997; Turner et al. 1991) and I will measure the buccolingual and mesiodistal dimensions of each tooth. The sites in this study contain large numbers of well-preserved teeth, making teeth ideal for biological distance study. While most traits are ranked, they will be dichotomized into presence-absence thresholds (Irish and Konigsberg 2007).

Analyses

I propose to examine burial treatment by comparing data on multiple spatial scales across two temporal periods – ECA and MCA. Multiple scales will highlight different local, regional, and macro-regional patterns. I will compare mortuary variables to determine how these vary with regard to age and sex. If burial variables distribute normally, I will use either a t-test or a nonparametric Mann-Whitney test to determine whether or not specific mortuary variables are statistically associated with age and sex groups. Correlations can be further tested using hierarchical cluster analysis or correspondence analysis. Leg flexion and body position have traditionally been used to identify the gender of an individual; these patterns remain to be verified and it is unclear whether they are truly regional. Grave goods may be a particularly important source of variability in burial treatment. There is some suggestion that items obtained through trade and interaction, such as obsidian, copper, and flints, may have a strong association with males (Dervenski 1997, 2000). Further, while females may have some of these items, male grave goods of the same material tend to be larger and heavier. Examination of the dimensions, weight, style, type, material, and percentage of grave inventory may reveal considerable variation between and within categories. Many variations may extend to the regional level and this may help me to demonstrate differences between cemeteries. In particular, I might expect considerable variability in burial treatments at regional cemeteries where large numbers of individuals with different traditions may have negotiated identities. This variability is also expected as archaeological evidence indicates differential access to materials on the Hungarian Plain.

In this project, biological distance and mortuary treatment may provide useful information on social and genetic relations between communities of individuals on the Hungarian Plain. For example, if Tiszapolgár-Basatanya represents a regional center used by communities across the Plain, then genetic distance correlated with differences in burial treatments may reveal the use of the cemetery by several populations. Regional cemeteries might be indicated by higher genetic variability than local cemeteries. If the genetic distance between cemeteries is large, then cemeteries may be utilized by local endogamous groups. If cemeteries are primarily local populations of isolated genetic groups, then regional variability in burial treatment may represent local traditions. Alternatively, some cemeteries may have continued older traditions (as is suggested for Vészto-Mágor, cf. Chapman 2000a). Individuals and communities may have negotiated identity based primarily upon available material culture and conditions. While this project focuses on comparisons between cemeteries, the same data could be used to make comparisons within cemeteries as well. If male-female comparisons on non-metric traits indicate heterogeneity, and one sex is more genetically homogenous, then post-marital relocation is likely indicating movement of individuals across the Plain (Stojanowski and Schillaci 2006). Changes in post-marital residence may result in changes in relations between genders that might appear in burial treatment. And, post-marital residence might reveal the social capital that may have been exchanged for wealth, as some models suggest.

I will compare populations both between and within cemeteries using frequencies of skeletal and dental traits. Trait frequencies could be compared between sexes using chi-squared tests, which would indicate traits that differ significantly by sex. To compare traits, I will use both a mean measure of divergence (MMD) statistic and a modified Mahalanobis distance statistic (Irish and Konigsberg 2007; Konigsberg 1990; Harris and Sjøvold 2004). Using these statistics, relationship (R) matrices can be produced to analyze the genetic similarity between populations. Mesiodistal and buccolingual measures could be analyzed using a MANOVA test or Mahalanobis distance, which would reveal significant differences by population in these data. Genetic relations between populations can be graphically demonstrated using hierarchical cluster analysis and principal components.

Hopes for a Bridge

This project is designed to answer fundamental questions about the nature of fluid or changing social networks as reflected in burial treatment (Chapman 2000a; Sherrat 1997a,b,d,e). It also examines how greater scales of interaction and exchange influenced prehistoric societies and expands upon previous studies by providing data on both the distribution of objects and biological relationships. Current archaeological and ethnographic data suggest some key changes in exchange networks might have produced differential access to materials and renegotiation of identities in burial treatment, but biological data will help discover the specific social relations that produced variability in burial treatment (Chapman 2008; Gyucha et al. 2009). The project will be used to help define the particular patterns of differentiation between and within cemeteries characteristic of the European Copper Age.

More importantly, this study illustrates how concepts of identity negotiation, borrowed heavily from modern cultural anthropology, might play out on the stage of the cemetery in the changing past. Archaeologists draw upon the work of cultural anthropologists to model actual human relations primarily from the study of objects. Without these key ethnographic studies, archaeologists are unable to truly understand the patterns of the past. Biological anthropology can use information from the human body itself to learn more about the individuals who produced the patterns in the material record, and how they might have directly related to other individuals. The combined efforts of at least three disciplines are required to do rigorous regional studies that reveal the social relations that might have caused large changes in the long scale of human history. If anthropology is to be a holistic study of human variety, as suggested by the AAA, then the fields must work together to gain a more complete understanding of humanity.

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