

BEYOND BALKANIZATION

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BALTIC-PONTIC STUDIES

V O L U M E 5 • 1998

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EASTERN INSTITUTE
INSTITUTE OF PREHISTORY
Poznań 1998
ISBN 83-86094-04-4
ISSN 1231-0344

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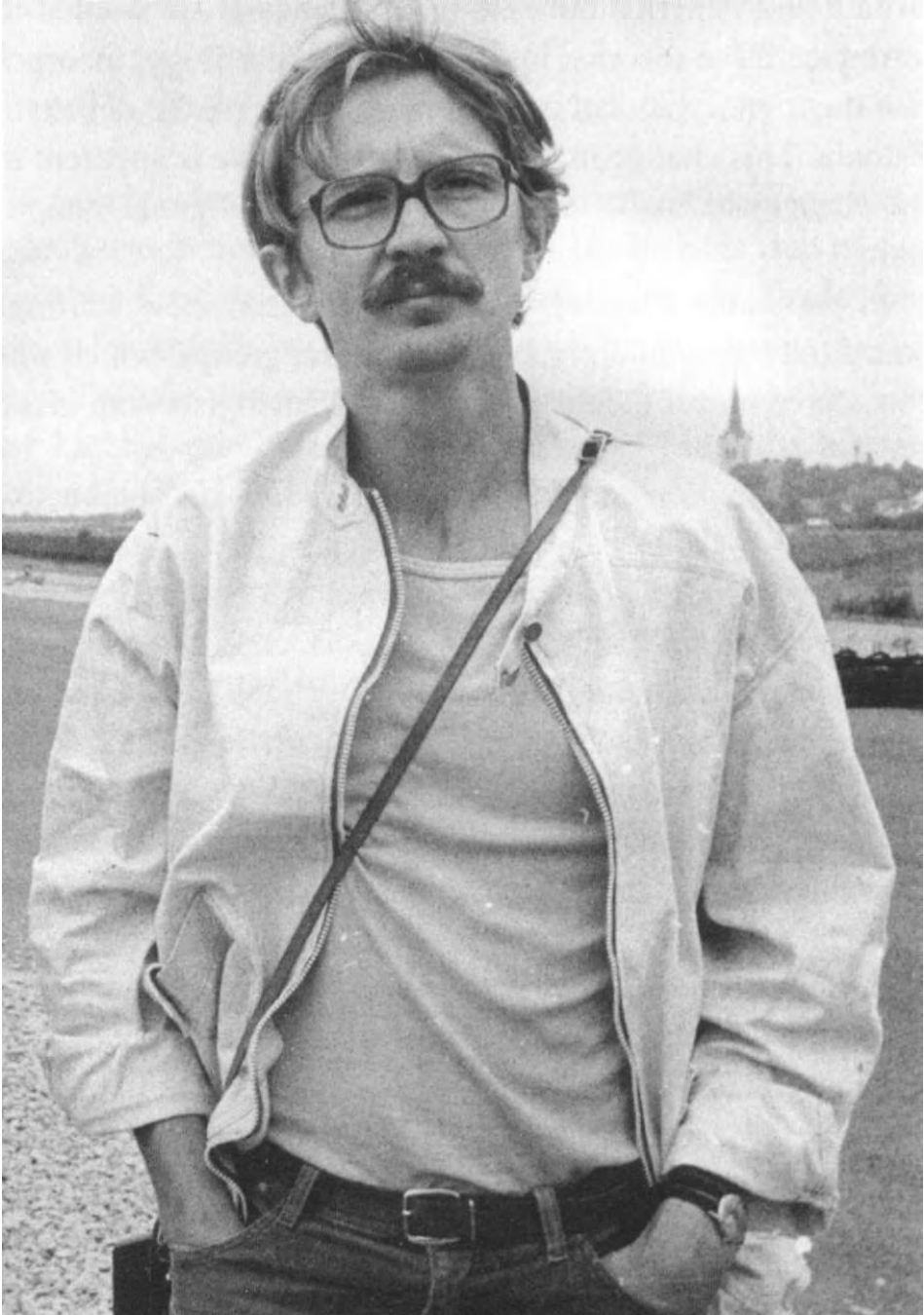
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Cover Design: Eugeniusz Skorwider

Linguistic consultation: Monika Wojcieszek

Printed in Poland

Computer typeset by PSO Sp. z o.o. w Poznaniu



In Memoriam Priit Ligi (24 May 1958 — 28 September 1994)

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Editor's Foreword

This volume contains the majority of the papers presented during a conference that took place on 16th-21st May, 1997 in Łódź, Poland. The conference was organized by the Institute of Archaeology, University of Łódź and Département d'anthropologie, Université de Montréal (Canada). The conference was funded by the University of Łódź and by IREX (International Research & Exchanges Board), which also supported this publication. The publication was partly founded by the University of Łódź and by the Foundation of Adam Mickiewicz University, too.

The major questions of the conference were, 1) what is the current evidence for eastern or southern influences in the development of eastern European Mesolithic and Neolithic populations, and 2) to what extent are current political trends, especially the reassertion or, in some cases, the creation of ethnic and national identities, influencing our interpretations of the prehistoric data.

The idea for such a conference came into being through the co-organizers' long-term studies of the development of those prehistoric human populations which inhabited the vast region stretching north and east from the Oder river and Carpathian Mountains to the foothills of the Urals. In a tradition established in modern times by Gordon Childe, virtually all of the transformations of Eastern Europe's Neolithic Age human landscape have been assumed to be responses to prior developments in the Balkan peninsula and Danube basin. We think that a body of new evidence requires a renewed analysis of the distributions of cultural products, peoples, and ideas across Eastern Europe during the Mesolithic through the Early Metal Age within a much wider geographic context than previously has been the case. This includes giving adequate attention to the far-ranging interactions of communities between the Pontic and Baltic area with those located in both the Caucasus and the Aralo-Caspian regions.

We hope that this volume will contribute to such a redirection of future analyses.

Lucyna Domańska
Ken Jacobs

Editorial comment

1. All dates in the *B-PS* are calibrated [see: *Radiocarbon* vol.28, 1986, and the next volumes] (other versions are cited for the wish of authors). Deviations from this rule will be point out in notes.

2. The names of the archaeological cultures (especially from the territory of the Ukraine) are standarized according to the English literature on the subject (e.g. Mallory 1989). In the case of a new term, the author's original name has been retained.

Alice Marie Haeussler

UKRAINE MESOLITHIC CEMETERIES: DENTAL ANTHROPOLOGICAL ANALYSIS

1. INTRODUCTION

The earliest known skeletal evidence for relatively large-scale habitation of Ukraine has been found in Dnieper Rapids Region Mesolithic cemeteries [Telegin 1982; 1989]. Hypotheses dealing with the affinities of the people buried in three of these, Voloshskoe, Vasilyevka I, and Vasilyevka III, are examined in this paper. According to I.I. Gokhman [1966] and T.S. Konduktorova [1973] the skeletal metrics of the skeletons excavated from these cemeteries incorporated a variety of physical features, which resulted from a complex regional interaction of peoples during the Mesolithic Era. Voloshskoe is thought to have contained two groups of peoples, Mediterraneans, who were narrow faced and very gracile, and Australoids (two skulls) [Debets 1955a]. Vasilyevka I burials were Ancient Mediterraneans and ProtoEuropeans, who were broad faced and massive North Europeans descended from a mixture of late Palaeolithic peoples, such as those from Brno and Předmostí [Konduktorova 1957; Gokhman 1966]. Vasilyevka III flexed burials were ProtoEuropeans, and Vasilyevka III extended burials were Mediterraneans [Gokhman 1966].

2. METHODS AND MATERIALS

To evaluate these hypotheses, I studied 32 dental morphological traits, three dental pathologies, and eight mortuary features in the Ukraine Mesolithic and comparative European and Near East samples [Haeussler 1995a; 1996, n.d.a]. The samples, curation information, and archaeological histories are listed in Appendix I. Their locations are shown in Figure 1.

The plaques and definitions of the Arizona State University and Dahlberg dental anthropology system were my standards for dental morphological trait eva-



Fig. 1. Map showing the locations of samples compared in the text.

luation. Following this system, frequencies of the dental features, including pathologies, are based on specimen counts [Dahlberg 1956; Turner et al. 1991]. Hypoplasia means two or more teeth with hypoplastic pits and/or lines; caries, one or more carious teeth per individual.

Because the samples are very small, I used the Coefficient of Similarity (C^s) and Index of Similarity (I^s) [Haeussler, n.d.a] for comparing the morphological dental trait frequencies. If two samples are very similar to one another, the C^s values should be close to 1.0. A high I^s value indicates a relatively large sample and/or many traits. A relatively low value reflects a very small sample size — usually six or less in the samples compared here. In this analysis, a C^s value with an I^s lower than 0.980 is considered less reliable than one with a value of 0.980 or greater. Appendix II has the formulae and brief explanations. The comparative C^s values are presented on diagonal bar graphs, which have been constructed so that each bar is rooted in the coordinates 0,0. The graphs have been rotated so that each of the bars is visible.

In addition to biological traits, I compared eight features associated with the burials in the Ukrainian and comparative samples (Table 1). In the absence of habitation sites, except at Voloshskoe, mortuary evidence is the only indication of

the culture of the deceased and the people who buried them [Binford 1971]. The features fall into three categories: those relating to 1) the burials (existence of a burial ground, presence of a habitation site, and proximity to a body of water), 2) the skeleton (body position, number of skeletons to a grave); and 3) personal grave goods (those from stone and bone, red ocher, and anthropomorphic figures).

For consistency, I have followed the chronological classification of Telegin [1982; 1989]: Voloshskoe, Vasilyevka I, Vasilyevka III flexed, and Vasilyevka III extended burials. Herein, *cemetery* means a burial ground. I have accepted as a cemetery any site designated as a *mogilnik* in the Russian-language literature or as a *cemetery* in English-language accounts. The mass grave at Předmostí is considered a cemetery for comparative purposes of this analysis. *Near East* means the lands around the eastern shores of the Mediterranean Sea, including northeastern Africa and southwestern Asia. The term *Mediterranean* includes the Near East.

The results of the analysis are partitioned into two topics. These are the regional heterogeneity of the Mesolithic people and the affinity of the Mesolithic people with Europeans and Near Easterners.

3. HETEROGENEITY OF THE UKRAINE MESOLITHIC SAMPLES

3.1. DENTAL ANTHROPOLOGICAL COMPARISONS

The dental morphological trait analyses support the concept that Ukraine Mesolithic peoples were biologically heterogeneous on a regional scale. By heterogeneous I mean that, out of the 22 features for which all four samples had trait sites, three traits occur in all of the samples with varying frequencies, nine traits are present in some samples and are absent in others, and nine traits are absent from all the samples [Haeussler 1996]. Figures 2 to 5 graphically illustrate that Vasilyevka I, Voloshskoe, and the two Vasilyevka III sub-samples are dentally different from one another. Were the samples homogeneous, the bars would extend to 1.0 or close to it. Voloshskoe and Vasilyevka I, the early samples of D.Y. Telegin's [1982; 1989] chronology, are dentally heterogeneous (Fig. 2, 3), as are the two Vasilyevka III sub-samples (Fig. 4, 5). The latter indicates that the two types of burials represent different peoples, regardless of chronology or archaeological typology.

Additional evidence for the dental heterogeneity of the four samples can be observed in the variations in the frequencies of dental hypoplasia. Percentages range from 0.0% in Voloshskoe to 20.0% in Vasilyevka I to 37.5% in the Vasilyevka III flexed burial subsample [Haeussler 1996]. The frequencies of hypoplasia in the Vasilyevka III flexed burial subsample (37.5%) differs from that in the Vasilyevka III extended burial subsample (9.1%). These variations indicate that the samples may

Archaeological features associated with burials

Site	Dates (BP)	Burial ground	Habitation site	Proximity to water	Body position	Single or multiple	Personal grave goods made from bone and stone	Red ochre	Anthropomorphic figures in burial
Ukraine Mesolithic									
Voloshkiy		Yes	Site	Dnieper River	Most flexed 13 on right 1 on left 2 on back, 2 extended	Most single 1 pair	Shell microlithic tools	None	None
Vasilyevka I		Yes	No	Dnieper River	24 flexed (16 on right, 8 on left)	Most single, 3 pairs	Fragments of blades with blunted edges trapezoid microblades scrapers	Yes	None
Vasilyevka III	10,080±100 to 8,030±100	Yes	No	Dnieper River	33 flexed on side (24 on right 9 on left, 1 on back) 7 extended	Most single, 3 pairs, 3 tripole	Microlithic tools	Yes	None
Fatma Koba		No	Unknown	Chernaya River	Flexed on right side	Single	None	None	None
Murzak Koba		No	Burial in site	Chernaya River	Extended head to east	Two	Worked bone, small blade trapeze, end scraper	None	None
Russian Palaeolithic									
Kostenki 2, 14, 15, 17, 18	38,080 $_{-3,460}^{+3,200}$	No	Yes	Don River	2 flexed (14, 18) 2 seated (2, 15)	Single	Headdress of polar fox teeth bone knife and needle, stone tools	Yes (14, 15)	None in burials

Site	Dates (BP)	Burial ground	Habitation site	Proximity to water	Body position	Single or multiple	Personal grave goods made from bone and stone	Red ocher	Anthropomorphic figures in burial
Sungir	25,500±200 to 14,600±600	?	Yes	Klyazma River	All extended on back		Thousands of beads and bracelets, pendants	Kostenki 14, 15 all Sungir	Horse and mammoth carvings
Russian Mesolithic									
Oleneostrovsky Mogilnik	5,700±80 to 9,910±80	Yes	Possibly ²	Lake Onega	Most (118) extended on back, 11 on side, 5 flexed, 5 vertical	Most (133) single, 15 double, 2 tripole	Elk teeth pendants, human and snake figures, quartz and flint arrow heads, flint inserts	Yes	Elk heads, human & snake figures
Popova	7,150±160 to 9,730±110	Yes	Small site nearby, uncertain relationship to cemetery	Kinem River	All extended on back		Animal teeth pendants, pits with bones & fragments of tools, possibly cultic in nature	Yes	None
Near East Palaeolithic									
Amud, Qafzeh, Skuhl, Tabun	27,000±500 to 45,000±2000	No	Caves	Unknown					
Near East Neolithic									
'Ain Ghazal	4,000 to 6,300	No	Yes	Unknown	Flexed, semi-flexed under house floors	Single, caches of skulls		Yes	Plaster human statues
Czech Republic Palaeolithic									
Předmostí	26,320±320 to 26,870±250	Yes	Yes	Unknown	Flexed	Mass grave	Mammoth scapula Flat pebbles, clay pellets	Yes	

Site	Dates (BP)	Burial ground	Habitation site	Proximity to water	Body position	Single or multiple	Personal grave goods made from bone and stone	Red ocher	Anthropomorphic figures in burial
Brno ¹	Würm II	No	No	Unknown	Unknown	Single	Mammoth tusk, scapula, rhinoceros ribs 600 shells (<i>Dentalia</i>) ivory & stone circles	Yes	Ivory human male statue

¹ Brno Information is for Brno II. ² According to Timofeev (personal communication).

Compiled from Bibikov [1940:175, Fig. 6], Zhirov [1940], Haeussler [1996: Table 37], Konduktorova [1973:9-12; 1974], Telegin [1982:Fig. 3, Table 24, 240-241; 1989:109, 123], Day [1986], Oshibkina [1983:180-191; 1989:37-38, 1990] Praslov [1984:110], Gurina [1989:31], Mamonova and Sulerzhitskiy [1989:Table 2], Price and Jacobs [1990], Jacobs [1994], Potekhina (personal communication), Potekhina and Telegin [1995], Adovasio et al. [1996], Svoboda, et al. [1996], Schmandt-Besserat [1997].

represent either 1) people who were members of different contemporaneous groups living under various cultural and subsistence-related stresses, such as those which might have been associated with the many cases of violent deaths [Konduktorova 1974; Nuzhnyi 1990; Balakan, Nuzhnyi 1995; Gokhman, personal communication]; or 2) people who lived at different times and under dissimilar ecological stresses that affected nutrition and eventually dental enamel formation [Hillson 1986]. In comparison, I found that only 5.3% of the dentitions in the Oleneostrovskiy Mogilnik sample had hypoplasia. In contrast, 61.8% of the burials in the Neolithic cemetery of Lokomotiv on the Angara River (6870 ± 70 to 6670 ± 80 BP*) [Mamonova, Sulerzhitskiy 1989] had hypoplasia [Haeussler 1996], as well as numerous individuals with evidence of violent death [Mamonova, Bazaliyskiy 1991].

In contrast to the broad range of frequencies of hypoplasia, the four Ukraine Mesolithic samples are alike in their mutual lack of caries, abscesses, and periodontal disease. The healthy status in these pathogen-related diseases in all four of the Mesolithic samples indicates a dependence on foods common to a hunter-gatherer subsistence, and a lack of habitual consumption of processed foods associated with a subsistence based on agriculture or transition to it [Turner 1979; 1982; Clarke *et al.*, 1986; Meikeljohn, *et al.* 1988].

3.2. ARCHAEOLOGICAL COMPARISONS

Variations in all three types of characteristics (features of the cemetery, the skeletons, and personal grave goods) indicate the cultural heterogeneity of the four Ukrainian Mesolithic samples (Table 1). Two features were common to the three cemeteries: location adjacent to the Dnieper river, a cemetery feature, and microliths. Although microliths can be interpreted as grave goods [Haeussler 1996], they are presently considered as evidence of conflict within the population [Balakin, Nuzhnyi 1995; Nuzhnyi, personal communication]. Microliths embedded in bone in three of the 12 flexed skeletons at Voloshskoe, two out of the 24 flexed skeletons at Vasilyevka I, and seven out of the 45 flexed skeletons at Vasilyevka III are indicative of violent deaths. Extended skeletons at Vasilyevka III also had microliths which differed in shape from those in the flexed burials [Nuzhnyi 1990; Balakin, Nuzhnyi 1995; Nuzhnyi, personal communication].

Two of the three cemeteries (Vasilyevka I and III) lacked evidence of an associated habitation site, a cemetery feature. This may indicate purposeful and possibly ceremonial transportation of the dead to a designated area apart from that on which the people lived. They were then positioned in a manner proscribed by the folkways of their culture, sprinkled with red ocher, and provided with grave goods indicative of themselves and the personal and community expressions of their cohorts. In light of the numerous violent deaths, the possibility of a battleground or a ritual

* The author used an uncalibrated version of the ^{14}C chronology (Editor).

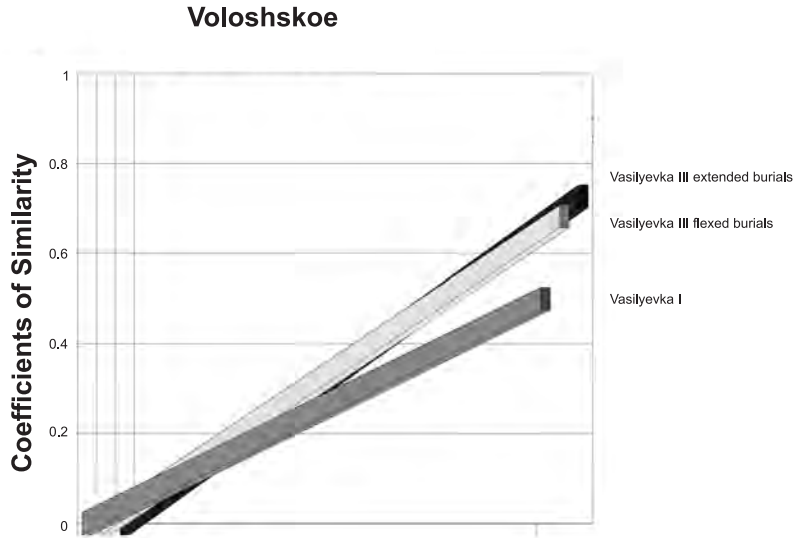


Fig. 2. Graph showing C^S values for Voloshskoe compared with the three other Ukraine Mesolithic samples: Vasilyevka I, the Vasilyevka III flexed burial subsample, and the Vasilyevka III extended burial subsample. Data for Figures 2 through 12 are given in Haeussler [1996, n.d.a]

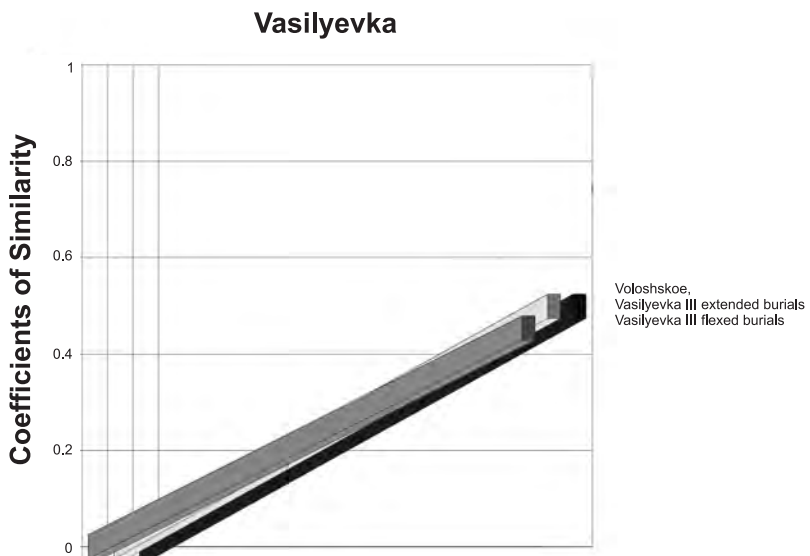


Fig. 3. Graph showing C^S values for Vasilyevka I compared with the three other Ukraine Mesolithic samples: Voloshskoe, the Vasilyevka III flexed burial subsample, and the Vasilyevka III extended burial subsample

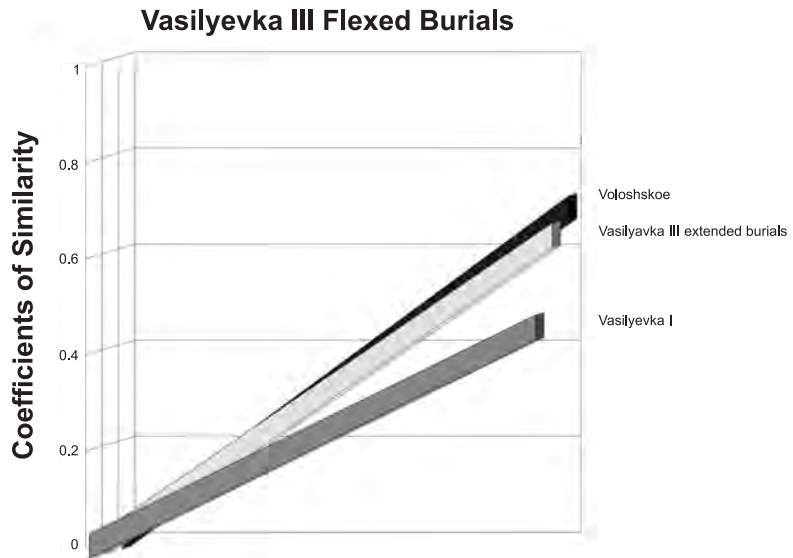


Fig. 4. Graph showing C^S values for the Vasilyevka III flexed burial subsample compared with the three other Ukraine Mesolithic samples: Voloshskoe, Vasilyevka I, and the Vasilyevka III extended burial subsample

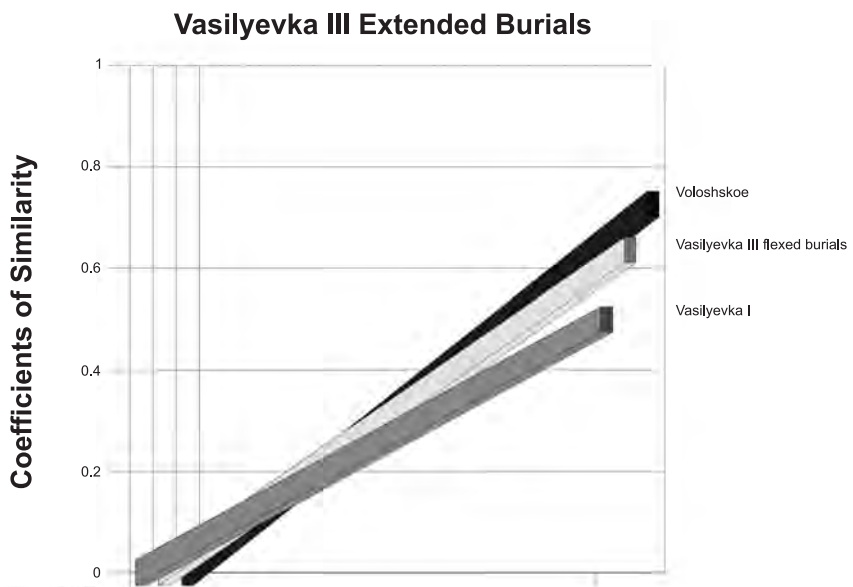


Fig. 5. Graph showing C^S values for the Vasilyevka III extended burial subsample compared with the three other Ukraine Mesolithic samples: Voloshskoe, Vasilyevka I, and the Vasilyevka III flexed burial subsample

burial ground for those involved in the conflict must be kept in mind [Nuzhnyi 1990; Balakan, Nuzhnyi 1995].

The numbers of individuals in a grave and positions of the skeletons differed within and among the cemeteries. In each cemetery single burials were in the majority. However, multiple burials also occurred in all three. Most remains were in a flexed position, although Voloshskoe and Vasilyevka III also had extended burials (Table 1). D.Y. Telegin [1982; 1989] has interpreted this flexed-extended burial dichotomy in Vasilyevka III as evidence for two diachronic cultures.

In features of a personal nature, the burials differed in two elements (a shell and red ocher) and were alike in one (microliths), discussed above. The shell (*Nassa reticulata*) [Nuzhnyi, personal communication] was found in only one Voloshskoe burial. Red ocher occurred in Vasilyevka I and Vasilyevka III flexed and extended burials, but not in Voloshskoe (Table 1).

3.3. SUMMARY

The dental morphological trait data suggest that the Voloshskoe, Vasilyevka I, and Vasilyevka III flexed and extended burial samples were heterogeneous on a regional scale. Archaeological evidence (differences in one cemetery feature, two skeletal features, and personal goods) points to the cultural heterogeneity of the samples. Variation in the dental pathology of hypoplasia indicates differential pathology-producing stress among the Mesolithic samples. Absence of dental pathologies of caries, abscess, and periodontal disease point to a homogeneous substance dependant on hunting and gathering.

4. NEAR EAST AND PROTOEUROPEAN AFFINITIES

The second part of this paper has a dental anthropological evaluation of an ancient Mediterranean (Near East) skeletal affinity for Voloshskoe [Debets 1955a], a Protoeuropean and ancient Mediterranean skeletal affinity for Vasilyevka I [Konduktorova 1957], a Protoeuropean skeletal affinity for Vasilyevka III flexed burials [Gokhman 1966], and a Mediterranean skeletal affinity for Vasilyevka III extended burials [Gokhman 1966]. The results of the dental morphological analysis are given in four pairs of bar graphs (Fig. 6 to 13). In each case, the first graph shows the comparative C^s values for the comparisons between a specific sample and all of the others. The second graph illustrates only the C^s values for samples with an I^s value equal to or greater than 0.980.

5. VOLOSHSKOE ANCIENT MEDITERRANEAN (NEAR EASTERN) AFFINITY

5.1. DENTAL MORPHOLOGICAL TRAIT COMPARISON

The dental morphological trait data add a European dental affinity to the Mediterranean and Australoid skeletal similarities of Voloshskoe suggested by G.F. Debets' osteological analysis [1955a]. The C^s values indicate that Voloshskoe is most closely dentally related to the Crimea Mesolithic and Caucasus Palaeolithic and Mesolithic samples. The sequence of decreasing relatedness continues in four additional European samples: the Czech Republic Palaeolithic, Sicily Upper Palaeolithic, Russian Upper Palaeolithic, and Russian Mesolithic. These are followed by the Near East Palaeolithic and Neolithic samples (Fig. 6), which are the least like Voloshskoe dentally.

Removal of comparisons with low I^s values (0.980 and less), that may be suspect due to the small numbers of traits and specimens, clearly illustrates the dental similarity between Voloshskoe and the European Russian Upper Palaeolithic and Mesolithic era samples. This relationship is closer than that between Voloshskoe and the Near East Palaeolithic and Neolithic eras (Fig. 7).

5.2. ARCHAEOLOGICAL COMPARISONS

Comparative archaeological analysis shows that Voloshskoe had some parallels with all of the extra-regional samples, but a basic difference from the Russian Upper Palaeolithic and Near East Palaeolithic and Neolithic sites (Table 1). Parallels existed in the proximity to a habitation site, flexed skeletal position, and the presence of personal grave goods, such as red ocher.

The Ukraine burials indicate that they and the Russian Upper Palaeolithic and Mesolithic peoples were members of different cultures. The basic difference is the presence of a cemetery at Voloshskoe and its absence at the Russian Upper Palaeolithic and Near East Palaeolithic and Neolithic sites. This observation, however, applies only to the sites compared in this study. For example, a Mesolithic cemetery existed at Afalou-Bou-Rhummel in Algeria [Vallois 1952].

Habitation sites were associated with Voloshskoe, as well as with most of the extra-regional comparative burial sites. Those at 'Ain Ghazal were in a village [Schmandt-Besserat 1997]. The Russian (Kostenki and Sungir) and Czech Republic Upper Palaeolithic (Předmostí) burials were associated with sites. A site may have existed at the Mesolithic cemeteries of Popova [Oshibkina 1982] and Oleneostrovskiy Mogilnik [Timofeev, personal communication]. The Crimean burials at Murzak Koba were also found within a site [Zhirov 1940].

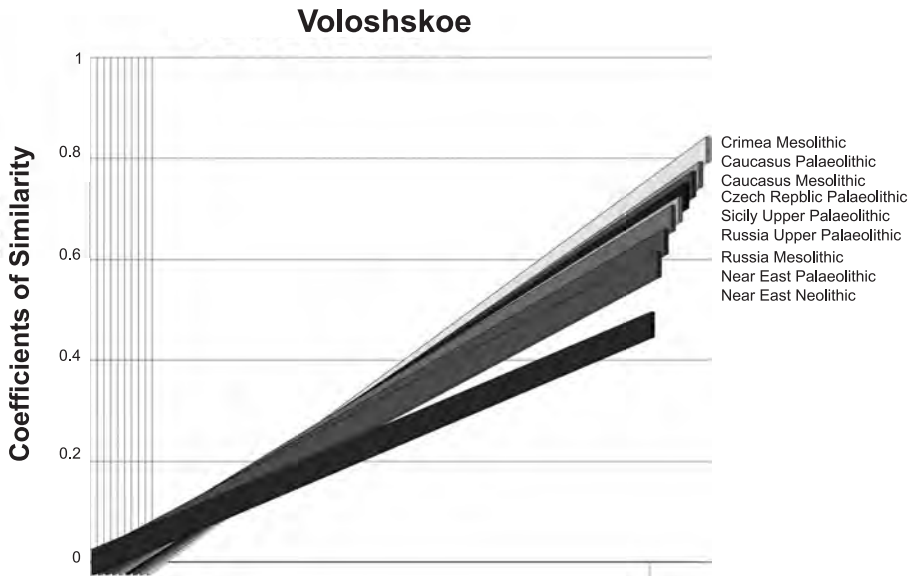


Fig. 6. Graph showing C^S values for Voloshskoe compared with the extra-regional samples

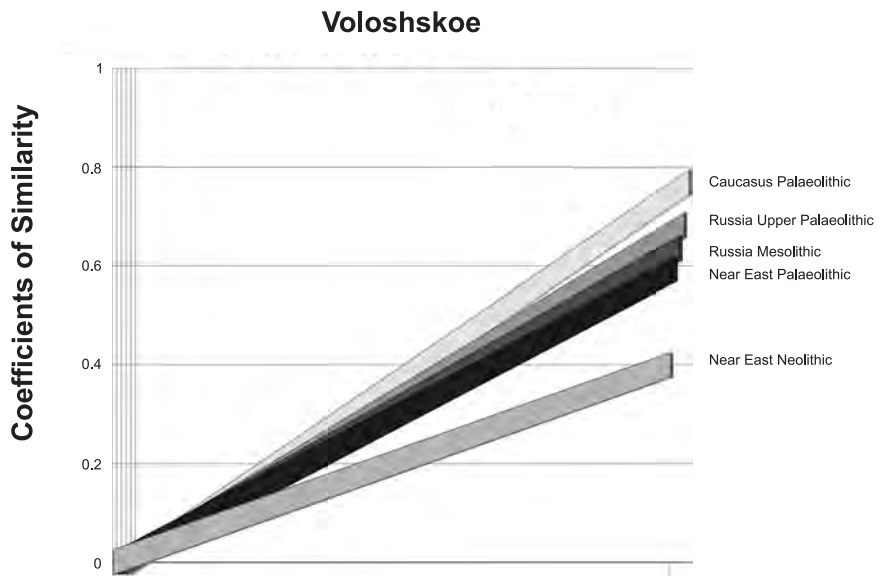


Fig. 7. Graph showing C^S values whose I^S values are 0.980 or greater for the Voloshskoe compared with the extra-regional samples

Nearly all of the comparative sites had flexed burials, which predominated at Voloshskoe (Table 1). The burials at Fatma Koba, Kostenki 14 and 18, a few Oleneostrovskiy Mogilnik graves, and all of the Předmostí and 'Ain Ghazal burials were flexed.

In spite of the parallels in the presence of a habitation site and the flexed position of the skeleton, the comparison of grave goods in Voloshskoe and Russian Upper Palaeolithic and Mesolithic cemeteries suggests membership in different cultures. Grave goods varied in quantity and in type. When compared with the wealth of artfully made objects found in the Russian Upper Palaeolithic and Mesolithic graves (Table 1), the Voloshskoe burials were relatively poor. Voloshskoe had a shell and microlithic tools, whereas the Russian Upper Palaeolithic and Mesolithic burials had elk head figures, zig-zag motif on bone, bear and beaver teeth, stone and bone tools at Oleneostrovskiy Mogilnik and animal teeth pendants, bones, and fragments of tools at Popova (Table 1). 'Ain Ghazal also had grave goods, yet they differed from those at Voloshskoe because they had plaster human figures and red ochre Schmandt-Besserat [1997].

The Mesolithic Ukrainians may have had less opportunity for artistic endeavors than did the Upper Palaeolithic and Mesolithic Europeans and Near Easterners. Direct evidence for violent death has been reported at Voloshskoe [Balakin, Nuzhnyi 1995], but not at Kostenki, Sungir, Oleneostrovskiy Mogilnik, or Popova. Yet, the numerous stone points in graves at Oleneostrovskiy Mogilnik [Gurina 1956: Fig. 14, 15, 21, 22, 25, 29, 33] could well have been involved in human life threatening activities. No such evidence has been reported in 'Ain Ghazal, although no explanation of the of the decapitations and caches of skulls has been published [Schmandt-Besserat 1997].

5.3. CONCLUSIONS ABOUT VOLOSHSKOE

Dental morphological trait data suggest that the individuals buried at Voloshskoe were dentally more like Palaeolithic and Mesolithic Europeans (Caucasus, Czech Republic, Russia, and Sicily) than the Palaeolithic and Neolithic Near Easterners compared here. Archaeologically, numerous parallel elements exist between Voloshskoe and all of the cemeteries. A major differentiating feature is the presence of a cemetery at Voloshskoe and the absence of a burial ground in the Near East, as well as the Caucasus Palaeolithic and Mesolithic, and the Russian Palaeolithic sites.

6. VASILYEVKA I PROTOEUROPEAN AND/OR MEDITERRANEAN AFFINITIES

6.1. DENTAL MORPHOLOGICAL TRAIT COMPARISONS

Vasilyevka I dental morphological trait frequency comparisons parallel the European and Near Eastern osteological similarities suggested by T.S. Konduktorova [1957]. The Crimean Mesolithic and Caucasian Palaeolithic and Mesolithic samples are the most similar to Vasilyevka I dentally, followed by the European Czech Republic Palaeolithic samples (Fig. 8). The Russian Palaeolithic and Mesolithic samples are seventh and eighth in the decreasing order of C^s values, with the Near East Palaeolithic and Neolithic samples occupying the places above and below the Russian samples (Fig. 8). Moreover, the Sicilian sample is dentally more like Vasilyevka I than are the Russian samples.

Elimination of the samples with low I^s values (0.980 or less) clearly illustrates the affinities between Vasilyevka I and both European and Near East samples (Fig. 9). The Vasilyevka I — European Russia C^s values fall between those of the Near East Palaeolithic and Neolithic comparisons (Fig. 9).

6.2. ARCHAEOLOGICAL COMPARISONS

As was the case with Voloshskoe, parallels exist between Vasilyevka I and the European Russian Mesolithic and the Czech Upper Palaeolithic Republic burials (Table 1). For example, Vasilyevka I and Oleneostrovskiy Mogilnik, Popova, and Předmostí were cemeteries with a predominance of single graves in Russia. Similar to the Voloshskoe comparisons, Vasilyevka I and Předmostí burials were mostly flexed, while extended burials predominated in Russian Upper Palaeolithic and Mesolithic graves. Red ocher and other grave goods was found these sites, although Vasilyevka I was relatively poor in grave goods when compared to the Russian and Czech Republic sites.

Like the Voloshskoe comparison, the major difference between Vasilyevka I and the Near East is the presence of a cemetery at Vasilyevka I and the lack of a burial ground at 'Ain Ghazal (Table 1). Yet, 'Ain Ghazal burials were similar to Vasilyevka I in two features (flexed body position and red ocher), although they differed in the presence of anthropomorphic figures at 'Ain Ghazal and their absence at Vasilyevka I.

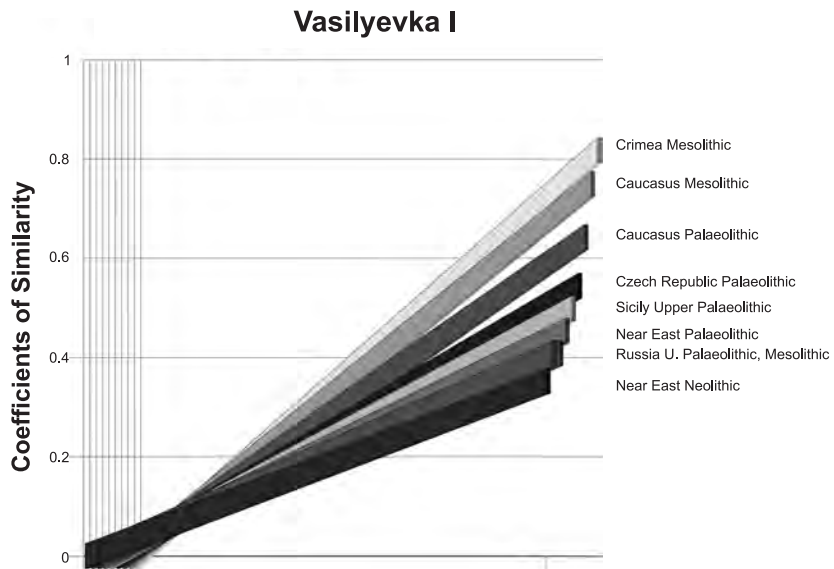


Fig. 8. Graph showing C^S values for Vasilyevka I compared with the extra-regional samples

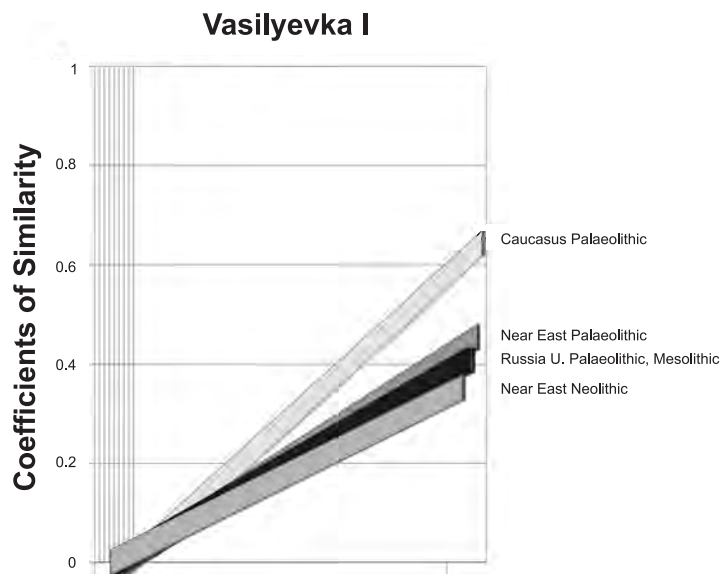


Fig. 9. Graph showing C^S values whose I^S values are 0.980 or greater for the Vasilyevka I and the extra-regional samples

Dentally, Vasilyevka I has affinities to both Near East and European samples analyzed herein. Archaeological evidence indicates some parallels between Vasilyevka I, European Upper Palaeolithic and Mesolithic, and Near East Neolithic burials (body position and red ocher). However, the presence of a burial ground differentiates the site from the Near East sites compared here.

7. VASILYEVKA III FLEXED BURIAL SUBSAMPLE — PROTOEUROPEAN AFFINITY

7.1. DENTAL MORPHOLOGICAL TRAIT COMPARISONS

The dental trait frequency comparisons (Fig. 10) support a close dental relationship between the Vasilyevka III flexed burial subsample and the European samples, as exemplified by the Russian Upper Palaeolithic and Mesolithic frequencies. These results parallel the outcome of I.I. Gokhman's [1966] osteological analysis.

As in the previous two comparisons, the Crimea Mesolithic and Caucasus Palaeolithic samples are more like the Vasilyevka flexed burial subsample than are all of the others. However, the Czech Republic Palaeolithic sample is only seventh out of nine in the order of relatedness. Unlike its place in the previous two comparisons, the Caucasus Mesolithic sample is the least like the Vasilyevka III flexed burial subsample.

Further comparison of samples whose I^s values are 0.980 or more clearly shows the close dental relationship between the Vasilyevka III flexed burial subsample and the European samples. The similarity is greater than that with the Near East Palaeolithic and Neolithic samples (Fig. 11).

7.2. ARCHAEOLOGICAL COMPARISONS

Parallels exist between the Vasilyevka III flexed burials and the Russian Mesolithic burials (Table 1). The Ukraine and Russian Mesolithic burials were in cemeteries. Interments were flexed and had grave goods and red ocher. However, the Russian cemeteries varied from the Vasilyevka III flexed burial subsample because Oleneostrovskiy Mogilnik and Popova had extended burials and a relative wealth of artistic grave goods.

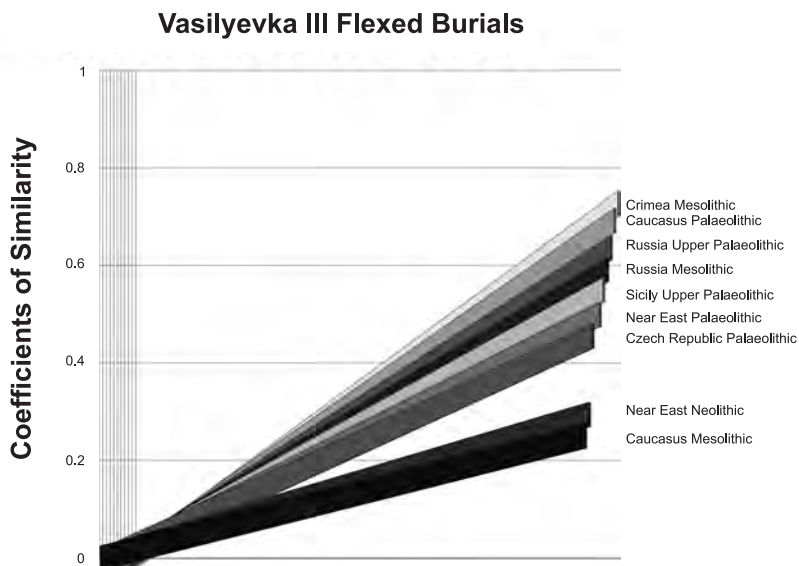


Fig. 10. Graph showing C^S values for the Vasilyevka III flexed burial subsample compared with extra-regional samples

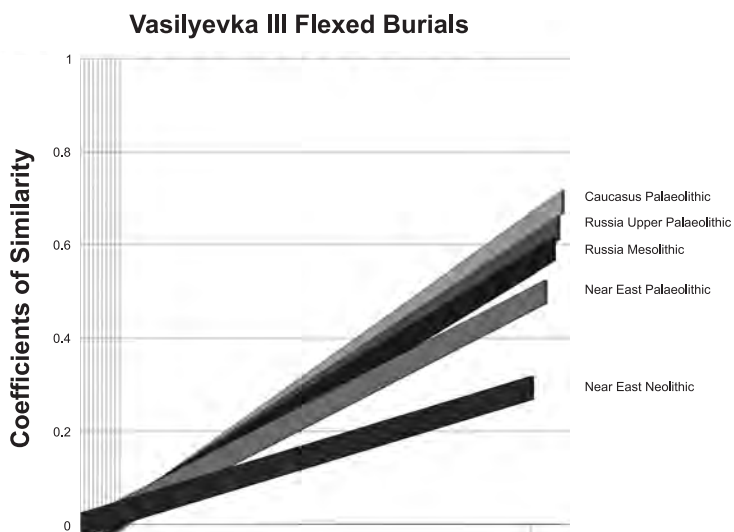


Fig. 11. Graph showing C^S whose I^S values are 0.980 or greater for the Vasilyevka III flexed burial subsample compared with the extra-regional samples

Some correspondences between the Vasilyevka III flexed burial subsample and Russian and Czech Upper Palaeolithic burials can also be found: a cemetery at Vasilyevka III and Předmostí but not at Kostenki, and flexed burials and other in Vasilyevka III, Kostenki (2 and 15), and Předmostí.

As was shown with the Voloshskoe and Vasilyevka I comparisons, basic archaeological differences with the Near East occur. These are the presence of a cemetery and the absence of anthropomorphic figures in all of the Ukraine Mesolithic cemeteries, and the reverse in 'Ain Ghazal.

7.3. CONCLUSIONS ABOUT VASILYEVKA III FLEXED BURIALS

Both the dental morphological trait and archaeological analyses support a close relationship between the Vasilyevka III flexed burial sample and Europeans, exemplified by the Russian Upper Palaeolithic and Mesolithic samples. This relationship is closer to European than to Near Eastern samples. The exception is the Czech Republic sample, which is dentally among the least like the Vasilyevka III flexed burial subsample.

8. VASILYEVKA III EXTENDED BURIAL SUBSAMPLE — NEAR EAST AFFINITY

8.1. DENTAL MORPHOLOGICAL TRAIT COMPARISONS

Comparison of the dental trait frequencies of the Vasilyevka III extended burial subsample shows Near Eastern (Mediterranean) relationships suggested by I.I. Gokhman's [1966] skeletal analysis, as well as affinities with European samples (Fig. 12). As was the case with the previous three comparisons, however, the Caucasus Palaeolithic and Crimean Mesolithic samples are the most dentally like the Vasilyevka III extended burial subsample. Contributing to the picture of dual affinities is the equidistance from the Vasilyevka III extended burial subsample of the Near East Palaeolithic and Russian Upper Palaeolithic bars midway in the sequence of C^s values (Fig. 12). In contrast, the Near East Neolithic sample is the least like the Vasilyevka III extended burial subsample.

Examination of samples with high I^s values (equal to or greater than 0.980) clearly shows the close relationship with the Caucasus Palaeolithic sample (Fig. 13). The similarity with Near East Middle Palaeolithic, and the Russian Upper Palaeolithic and Mesolithic samples are also clearly illustrated. As has been the

case with comparisons with Voloshskoe, Vasilyevka I, and the Vasilyevka III flexed burial subsample, the Near East Neolithic sample is the least like the Vasilyevka extended burial subsample.

8.2. ARCHAEOLOGICAL COMPARISONS

Comparison between Vasilyevka III extended burials and those from Upper Palaeolithic and Mesolithic Russia shows numerous similar features, especially in the Mesolithic samples (Table 1). As has been discussed above, the Russian Upper Palaeolithic site of Kostenki lacks a burial ground, whereas Vasilyevka III was a cemetery. Mesolithic Russian similarities with Vasilyevka III are the presence of a cemetery, extended burials, single and multiple burials, and red ocher. As has been the case in the previous three comparisons, the Russian cemeteries had artistic grave goods. Yet, Vasilyevka III extended burials had only microlithic tools.

A Near East Palaeolithic and/or Neolithic cultural relationship in material culture evidence is less evident than a European affinity. As has been pointed out above, the Near East Palaeolithic sample lacks evidence of purposeful burials. The single cultural commonality between Vasilyevka III extended burials and those at 'Ain Ghazal was presence of single burials. Near East Neolithic burials differed from the Vasilyevka III extended burials because of the lack of a cemetery, flexed body position, interment under house floors, and anthropomorphic figures at 'Ain Ghazal (Table 1).

8.3. CONCLUSIONS ABOUT VASILYEVKA III EXTENDED BURIALS

Dental morphological trait analysis shows European, as well as a Near East affinities, for Vasilyevka III extended burials. Archaeologically, the Vasilyevka III extended burials had more features that parallel those associated with Russian Mesolithic cemeteries than other graves examined for this study, including Near East Neolithic burials.

9. CRIMEA AND THE CAUCASUS

Until recently [Haeussler 1995b, n.d.a] the two samples that have placed at the top of Figures 6, 8, 10, and 12 have not been analyzed in dealing with the Mesolithic Ukraine affinities. The Caucasus Palaeolithic and Crimea Mesolithic samples, small

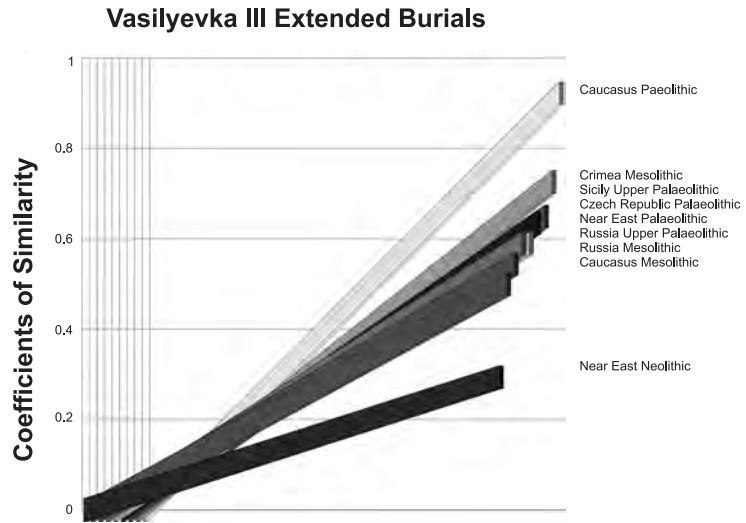


Fig. 12. Graph showing C^S values for the Vasilyevka III extended burial subsample compared with the extra-regional samples

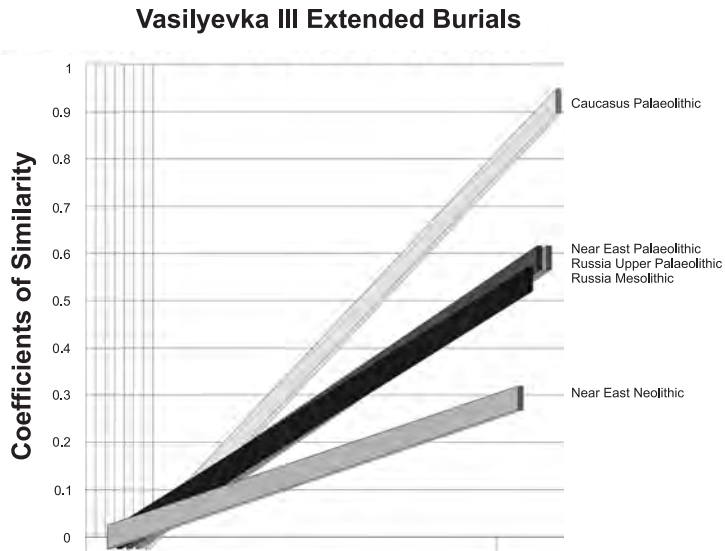


Fig. 13. Graph showing C^S values whose I^S values are 0.980 or greater for the Vasilyevka III extended burial subsample compared with the extra-regional samples

as they are, cannot be overlooked here because of their geographic proximity to Ukraine.

In spite of the similarity in dental morphological trait frequencies, however, no cultural parallels exist (Table 1). For example, the Caucasus Palaeolithic materials lack evidence of purposeful burials. The unstable position of the Caucasus Mesolithic sample on Figures 6, 8, 10, and 12 can be interpreted by small sample size and few trait sites: two individuals represented only by the mandibles. Archaeological analogies cannot be made, because no evidence for purposeful burial has been found at either Kvachara or any other Caucasus Mesolithic site [Tsereteli, personal communication].

In Crimea the Fatma Koba and two Murzak Koba individuals had likely been purposefully buried, as evidenced by the positions of the skeletons. However, they differed from the Dnieper River burials by the lack of a cemetery and personal grave goods (Table 1).

10. DISCUSSION

The osteological, dental anthropological, and archaeological information given above indicate that the Mesolithic population of the Dnieper Rapids region was indeed complex. This complexity required more than a single linear peopling event, be it of a short or long duration. For example, the dental anthropological comparisons parallel the osteological analyses in two out of the four samples, Vasilyevka I and the Vasilyevka III flexed burial subsample. Vasilyevka I has an alternating sequence (Caucasus Palaeolithic, Near East Palaeolithic, Russia Upper Palaeolithic, Russia Mesolithic, and Near East Neolithic) of dental trait frequency similarities and similarities to Near East and European skeletal traits [Konduktorova 1957]. The Vasilyevka III flexed burial subsample has dental traits more similar to the European (Caucasus Palaeolithic, Russia Upper Palaeolithic) than to the Near East Palaeolithic and Neolithic samples compared here and skeletal [Gokhman 1966] traits similar to Europeans.

Two of the samples, Voloshskoe and the Vasilyevka III extended burial subsample, have a mixture of dental and skeletal affinities. Voloshskoe has dental morphological trait frequencies more similar to the European samples than to the Near East samples compared herein, but is skeletally like Near Easterners [Debets 1955a]. The Vasilyevka III extended subsample has an alternating sequence (Caucasus Palaeolithic, Near East Palaeolithic, Russia Upper Palaeolithic and Mesolithic, and Near East Neolithic) of dental relatedness to both Near Eastern and European samples compared here, but has Mediterranean skeletal features [Gokhman 1966].

Archaeologically, in spite of the presence of numerous parallels in individual skeletal and grave goods features, the Ukraine cemeteries are more like the Russian Mesolithic and Czech Palaeolithic burial grounds than all of the other sites com-

pared here. The differentiating feature is the presence of cemeteries in these sites and their absence in the Near East Palaeolithic and Neolithic, Caucasus Palaeolithic and Mesolithic, and Russian and Sicilian Upper Palaeolithic sites. The presence of a cemetery has more weight than any other burial feature because its very existence reflects a society, whereas elements pertaining to the skeleton and personal grave goods reflect membership in a sub-unit of the population, such as a clan, family, or cohort.

Yet the Ukraine burials have relatively less grave goods than those in Russia and the Czech Republic. Whether the existence of conflict within the Ukraine Mesolithic Era contributed to this relative paucity of grave goods requires a careful examination of the Oleneostrovskiy Mogilnik materials. Unfortunately, nearly all of the Předmostí skeletons have been destroyed.

Interpretation of these seemingly contradictory physical anthropological and archaeological data relies on the Dnieper river and its paleoecology during the Boreal Era. The Dnieper River is presently the fourth longest river in Europe, exceeded only by the Danube, Ural and Volga rivers. It originates northwest of Moscow in the Valdai Hills, whose highest summits form the drainage divide between the Volga, Western Dvina, Msta, and Dnieper rivers. The Dnieper river flows southward, traversing the Polesye lowlands of Russia, Belorussia, and Northern Ukraine. From Kiev southward, the Dnieper River flows along the Ukrainian Shield, thereby delineating the Dnieper Uplands on the west from the Dnieper-Donetsk Lowlands extending to the east [Soffer 1985; Howe 1994]. Approximately 2,255 km from its source, the Dnieper River empties into the Black Sea east of the mouths of the Danube and Dniester, and west of the mouth of the Don Rivers.

During the Valdai Glacial Era (Würm in Western Europe, Wisconsin in North America), the northern part of the Dnieper River was less attractive to humans looking for permanent habitation than it was during the Boreal Era. It was situated in a zone of continuous permafrost that reached from the Scandinavian Ice Shield in the west to the Sea of Japan in the east. The southern portion of the Dnieper River flowed through a region of discontinuous permafrost that extended from Poland to China. The mouth of the river was in an a zone that experienced deep seasonal freezing [Baulin, Danilova 1984]. During the glacial maximum, the last part of which saw occupation of Upper Palaeolithic sites such as Mezhirich, south of Kiev, the land was a periglacial steppe-forest, a combination of steppe on a watershed with rarified forests along river floors [Dolukhanov, personal communication].

By the Boreal Era, which coincided with the Mesolithic era, forests extended southward from the zone of tundra that bordered the Arctic Ocean. Most of the zone of discontinuous permafrost and deep seasonal freezing had become a mixed grass and xerophytic steppe. During the years which encompassed the development of the cultures represented by the Mesolithic Dnieper Rapids cemetery samples, the forest zone moved south to the region of Kiev. From Kiev to the Black Sea, the land remained a steppe [Baulin, Danilova 1984; Dolukhanov, Khotinskiy 1984], which gradually transformed into a steppic corridor [Dolukhanov, personal communication].

Zones, such as the land around the Dnieper Rapids were ecologically abundant, attracting the animals and fish on which the Mesolithic peoples depended for their subsistence [Nuzhnyi, personal communication]. By 9,000 BP the megafauna, which the Upper Palaeolithic peoples utilized, had become extinct. Ecological conditions permitted domestication of animals and later, albeit sporadically, plants [Dolukhanov, Khotinskiy 1984].

Demographically, the Boreal Era Dnieper Rapids region was accessible by the Dnieper River from the north and from the south. The area could also be reached from the west via the tributaries of the Dnieper River and from the east via eastern tributaries and the plains, as the open southern Dnieper River region land supported increasing numbers of peoples.

After the retreat of the Scandinavian Ice Shield, many of the forest dwelling Mesolithic people in northern Russia, may have retained their forest-adaptation and remained in the north. As the Boreal Era forests expanded southward, some northern people and their cultures, such as relatives of those buried at Popova and Oleneostrovskiy Mogilnik, could have moved southward with the forests. Peoples from Crimea, the Caucasus, and the Near East to the south could have moved northward at different times and with varying degrees of successful occupation. However, any movement of people from the Near East and the Mediterranean Sea region had to involve circumventing part of the Mediterranean and arriving at the Black Sea by some route that involved either the Caucasus Mountains and possibly the western Caspian region or Turkey and Bulgaria.

Therefore, the variations in dental trait frequencies, osteological affinities, and archaeological remains discussed above indicate that we may be looking at the result of microevolutionary events caused by complex movements of peoples and their cultures, as suggested by I.I. Gokhman [1966] and T.S. Konduktorova [1973]. This would have occurred when the Boreal Era steppe landscape of Ukraine could support larger numbers of peoples than it did during the Upper Palaeolithic Era, when the land was a zone of deep seasonal freezing.

Such microevolutionary events may not be unique to the Dnieper River. As an example, Kievan monuments to historically important interactions of peoples during the past millennium illustrate the types of microevolutionary events that may occurred during the 2,000 carbon dated years represented in the Mesolithic samples. These are the memorial to Ki, Shek, Khorib, and Lebid; the Sophia Cathedral; Babi Yar; and the monument to the Great Patriotic War (World War II). In spite of a great amount of documentation, do not know the extent to which the skeletal and dental traits of contemporary Ukrainians reflect any of these historical events.

For example, Ki, for whom Kiev is named, along with Shek, Khorib, and their sister Lebid were Rus who came from the north by boat in the 9th century. They settled the hills of contemporary Kiev, but we do not know whether they mixed with or replaced the gene pool of the aboriginal people.

The Sophia Cathedral was built by Yaroslav the Wise in 1037 to commemorate his victory over the Pechenegs, a Turkic people who aggressively occupied the steppe north of the Black Sea. The church was also planned as a symbol to unify the

local tribes through a common religion and language. It was designed by and built by Greeks and modeled after the Hagia Sophia in Istanbul. Writing on the walls is evidence of the first Russian writing, which utilized the Greek alphabet. Both the religion and the language have persisted by replacement of those that existed previously. Apparently, the Pechenegs were unsuccessful in making a genetic impact on the gene pool. Yet, we do not know the extent to which the skeletal and dental traits of Yaroslav and his contemporaries replaced or mixed with the local people.

Three hundred years later, the Mongol horde sacked Kiev. However, the Mongols left little impact on the physical appearance of the people. S.P. Segeda suggested that the event was too swift for their physical features to be apparent in the contemporary people. Yablonskiy [1986] proposed that only the high officials were truly Mongols and too few to have made a lasting genetic impact.

Babi Yar is the site of fratricide and genocide of thousands of individuals during the 1940's. Although a few descendants of Babi Yar peoples, their religion, and their culture persist today, we do not know the extent to which their skeletal and dental traits will remain in the population.

The most visible landmark in Kiev is an immense eastward looking female figure, a monument to the defenders against the most recent invaders, who more than 40 years ago failed to colonize the Dnieper. The invaders were defeated and their skeletal and dental traits failed to replace those of the thousands of members of the local population buried singly and in the large cemetery to the north. Deciding factors in the victory were ecology, which may leave its mark in the archaeological and geological record, and the tenacity of the Ukrainian defenders, which will live only in the memories of their descendants.

11. SUMMARY AND CONCLUSIONS

Examination of morphological and pathological traits and material culture evidence from burials in three cemeteries suggests agreement with I.I. Gokhman [1966] and T.S. Konduktorova [1973] that the physical features of the Ukraine Mesolithic people were the result of a complex interaction of peoples during or preceding the 2,000 carbon-dated years spanned by these samples. Voloshskoe, Vasilyevka I, and Vasilyevka III flexed and extended burial subsamples are dentally and archaeologically heterogeneous on a regional scale. Inter-regionally, the Voloshskoe and Vasilyevka III flexed burial samples are dentally more like the Russian Upper Palaeolithic and Mesolithic samples than those from the Near East studied herein. However, Voloshskoe skeletons are similar to those in from the Near East [Debets 1955a], while Vasilyevka III flexed burials are skeletally like Europeans [Gokhman 1966]. In contrast, Vasilyevka I and the Vasilyevka III subsample have an alternating sequence of dental relatedness to European and Near East samples examined du-

ring this study. However, the Vasilyevka I skeletons resemble Europeans and Near Easterners [Konduktorova 1957] and the Vasilyevka III extended burials, Mediterranean people [Gokhman 1966].

Archaeologically, Voloshskoe, Vasilyevka I, and Vasilyevka III have features that vary on the level of intra-regional cultural variation. Inter-regionally, the three cemeteries are more like European burial grounds than the Near East graves.

Interpolation of geographical, ecological, and historical information into these results suggests that the Mesolithic peopling of the Dnieper River occurred when the Boreal Era steppeland of Ukraine was capable of supporting larger numbers of peoples than it did during the Upper Palaeolithic Era, when the land was a zone of deep seasonal freezing. The dental and skeletal traits in these samples may be the result of numerous microevolutionary events as people moved with varying degrees of success and permanency into the Dnieper Rapids region from the south (Near East, Caucasus, Crimea), west (Czech Republic), north (Northern Russia), and east (Eastern Russia)*

* I am grateful to Kenneth Jacobs and Lucyna Domańska for the invitation to participate in the symposium "The Future of the Past of Central Europe" and to contribute this work to the symposium proceedings.

I further acknowledge with gratitude the personal and professional hospitality and assistance of S.P. Segeda, I. Potekhina, T.A. Fugich, S. Kruts, and N. Mikhaylovna of the Institute of Paleontology of the Institute of Archaeology of the Ukraine Academy of Sciences, Kiev; I.I. Gokhman, A.G. Kozintsev, Y.D. Benevolenskaya, V.I. Bogdanova, A.I. Buraev, Y.K. Chistov, A. Gromov, V.I. Khartimovich, A.B. Radzyum, S.S. Sankana, O. Sukhanova, and O. Vorobyeva of the Museum of Anthropology and Ethnology, St. Petersburg; V.P. Chtetsov, T.A. Alekseeva, S. Efimova, V.M. Kharitonov, T.S. Konduktorova, N.N. Miklashevskaya, and I.V. Perevozchikov of the Institute of Anthropology, Moscow State University, Moscow; G.V. Lebedinskaya, T.S. Balueva, M. Butovskaya, and A.P. Pstryakov of the Institute of Plastic Reconstruction, Moscow; M.G. Abdushelishvili and V.F. Kashibadze of the Sector of Anthropology, Institute of History, Archaeology, and Ethnography of the Georgian Academy of Sciences, Tbilisi; O. Lordkipanidze, L. Nebierdze, M. Nioradze, M. Puteridze, and M.L. Tseritelli of the Center for Archaeological Investigations of the Georgian Academy of Sciences, Tbilisi; A. Vekua of the Institute of Paleobiology of the Center for Archaeological Investigations of the Georgian Academy of Sciences, Tbilisi; L.A. Chelashvili, T. Davlimadze, Z. Kikodze, and D. Tushabramishvili of the State Museum of Georgia, Tbilisi; J. Zias of the Rockefeller Museum, Jerusalem; E. Burgio of the Museo di Geologia, Palermo; M. Dokládál of Masarykovy University, Brno; and M. Oliva and M. Dočkalova of the Anthropos Institute of the Moravian Museum, Brno.

Some of the literature and background material for this article was provided through generous gifts from T.I. Alekseeva, E. Burgio, M.M. Gerasimova, I.I. Gokhman, K. Jacobs, V.M. Kharitonov, T.D. Konduktorova, A.G. Kozintsev, G.V. Lebedinskaya, O. Lordkipanidze, N.N. Miklashevskaya, N.N. Mamonova, L. Nebuerdze, M. Nioradze, I. Potekhina, M. Puteridze, S.P. Segeda, M.L. Tseritelli, D. Tushabramishvili, and A.A. Zubov. Gratitude for invaluable assistance and information about the specimens and the institutes in which they are curated are due to S.A. Arutiunov, Institute of Anthropology and Ethnography, Moscow; M.J. Becker, West Chester University; G. Falsone, Archaeological Institute, Palermo; D. Frayer, University of Kansas; and C.G. Turner, Arizona State University.

Research for this work was supported in part by a grant from the International Research and Exchanges Board (IREX). Additional support has been provided by the Arizona State University chapters of Phi Kappa Phi and Sigma Xi, the Office of the Vice-President for Research, the Department of Anthropology, and the Graduate College of Arizona State University.

Appendix I. Samples, site locations, institutes where examined, and archaeological and publication history.

Site	Location	Number of Specimens	Institute
UKRAINE			
Ukraine Mesolithic			
Voloshskoe	Near Dniepropetrovsk East Bank Dnieper River	15	IA
Vasilyevka I	Near Dniepropetrovsk East bank Dnieper River	15	IA
Vasilyevka III (flexed)	Near Dniepropetrovsk East Bank Dnieper River	11 (Burials 12, 16, 18, 22, 24, 25, 26, 27, 37, 38, 42)	MAE
ekasilyevka III (extended)	Near Dniepropetrovsk East Bank Dnieper River	9 (Burials 10, 14, 19, 23, 31, 33, 34, 35, 36)	MAE
Crimea Mesolithic			
Fatma Koba	Badarskaya Valley	1	MAE
Murzak Koba	Badarskaya Valley	2	MAE
EUROPE			
Czech Republic Palaeolithic			
Brno	Brno 1 from Červený Kopec south of Brno, Brno 2 from Francouzská Street in Brno, Moravia	2 (Brno 1 and 2)	MM
Předmostí	Near Přerov, northeast of Brno, Moravia	4 (2 casts: IV K319 and unlabeled; 2 mandibles: A17088) ¹	MM
Russian Upper Palaeolithic			
Kostenki	Don River near city of Voronezh	5 (Kostenki 2, 14, 15, 17, 18)	MAE
Sungir	Vladimir District, near city of Vladimir	3 (Sungir 1, 2, 3)	LAR
Russian Mesolithic			
Oleneostrovskiy Mogilnik	Karelian Republic, on Yuzhny Oleniy Ostrov in Lake Onega, 300 km northeast of St. Petersburg	38	MAE
Popova	Kargapolskiy District, Archangelsk region, left bank Kinem River, which flows into Lake Lacha	3	MAE
CAUCASUS			
Caucasus Palaeolithic			
Akhshtyr	Russia, Sochi-Adler Pontic Area	1	MAE
Barakaevskaya Cave	Russia, Kuban River Basin	2 (Barakaevskaya v, g)	MAE
Dzhurchula Cave	Georgia, Tkibulskiy District	1	GMG
Ortvala Cave	Georgia, Terdzhoiiski District	2 (2420, 3117)	IPTsIANG
Sakazhia Cave	Georgia, Terdzhoiiski District	5 (486, 606, 607, 1125, 1133)	IPTsIANG
Caucasus Upper Palaeolithic			
Devis Khvreli	Georgia, Zastafon District	1	GMG

Site	Location	Number of Specimens	Institute
Caucasus Mesolithic Kvchara	Georgia, near the Black Sea	2	Photo L. Tsereteli
NEAR EAST Near East Upper Palaeolithic Qafzeh DK-H2	Israel, 2.5 km from Nazareth, southwest flank of Mount Qafzeh	1	RM
Near East Palaeolithic Amud	Israel, Wadi Amud, 50 km east- north-east of Haifa	1	RM
Qafzeh 9, 11	Israel, 2.5 km from Nazareth, southwest flank of Mount Qafzeh	2	RM
Skuhl I and IV	Israel, Wadi-el-Mughara, Mount Carmel, southeast of Haifa	2	RM
Tabun II	Israel, Wadi-el-Mughara, Mount Carmel, southeast of Haifa	1	RM
Near East Neolithic 'Ain Ghazal	Jordan, northeast edge of Aman	16	Data from Roller (1992)
MEDITERRANEAN Sicily Upper Palaeolithic San Teodoro	Near Messina, Italy	2 (San Teodoro 1 and 2)	MGP

¹ One of the mandibles is “possibly” Předmostí according to M. Dočkalová, physical anthropologist at the Moravian Museum. Provenance numbers of all of the Russian and Ukrainian specimens are given in Haeussler [1996].

Archaeological and Publication History

Voloshskoe: Excavated by E.F. Lagodovskaya in 1946, A.V. Bodyanskiy and V.N. Danilova in 1952, V.N. Danilenko in 1953, and A.V. Bodyanskiy in 1954. Osteological description by Debets [1955a] and Gokhman [1966]. Skeletal and dental metrics in Jacobs [1993a; 1994]. Dentition in Haeussler [1995a; 1996; 1998, n.d.b.]. Catalogued in Gokhman and Kozintsev [1980].

Vasilyevka I: Excavated by A.D. Stolyar in 1953 and described by Stolyar [1957, 1959]. Osteological description by Konduktorova [1957] and Gokhman [1966]. Skeletal and dental metrics in Jacobs [1993a; 1994]. Dentition in Haeussler [1995a, 1996, 1998, n.d.b.]. Catalogued in Gokhman and Kozintsev [1980].

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Abbreviations

GMG	State Museum of Georgia, Tbilisi, Georgia
IA	Institute of Anthropology, Moscow State University, Moscow Russia
MM	Moravian Museum, Brno, Czech Republic
IPT&IANG	Institute of Paleobiology, Center for Archaeological Investigations, Georgian Academy of Sciences, Tbilisi, Georgia
LAR	Laboratory of Plastic Reconstruction, Moscow, Russia
MAE	Museum of Anthropology and Ethnography, St. Petersburg, Russia
MGP	Museo di Geologia, Palermo, Italy
RM	Rockefeller Museum, Jerusalem, Israel

Appendix II

The coefficient of similarity (C^S) is a simple numerical indication of the similarity of two small samples being compared. The C^S is based on the percentage of parallel trait expressions. Parallel trait expression is defined as a frequency of a trait in one sample that is within 5.0% of that in the sample being compared, the 5.0% being allotted to chance. This type of simple calculation was devised because the goal of the C^S is to quantify similarities between samples, which are too small to achieve statistical significance with the commonly used [Hanihara 1976; Irish 1993; Lukacs, Hemphill 1992; Turner 1985] Mean Measure of Divergence.

The C^S values are based on the mean of the numbers of traits with similar expressions, rather than on the cumulative differences in frequencies between samples. The larger the value of the C^S , the greater the similarity between two samples being compared.

The formulae for the coefficient of similarity (C^S) are:

when $X_{ni} = \frac{K}{N}$ is the frequency of a single trait,

when K is the number of positive observations of trait_{*i*} in sample_{*n*} being compared,

when N is the number of possible observations (trait sites) of trait_{*i*} in the sample_{*n*} being compared,

when T is the number of traits being compared,

when D is the number of dentitions in the sample being compared,

when $(X_{1i} - X_{2i}) > 0.5$, $|(X_{1i} - X_{2i})| = 0$,

when $(X_{1i} - X_{2i}) \leq 0.5$, $|(X_{1i} - X_{2i})| = 1$,

the Coefficient of Similarity is:

$$C^S = \frac{\sum_{i=1}^t |(X_{1i} - X_{2i})|}{T}$$

Since the C^S based is only on frequency data, the Indicator of Similarity (I^S) provides a simple assessment of sample size (D_n) and the number of traits (T) being compared. The lower the I^S value, the less the likelihood that the C^S value is meaningful.

The formula for the Indicator of Similarity (I^S) is:

$$I^S = 1 - \left[\frac{1}{TD_1} + \frac{1}{TD_2} \right].$$

ABBREVIATIONS

AR	– Archeologicke rozhledy, Praha.
AP	– Archeologia Polski, Wrocław.
AJPA	– American Journal of Physical Anthropology, New York.
CA	– Current Anthropology, Chicago.
KSIA	– Kratkiye Soobshcheniya Instituta Arkheologii Akademii Nauk USSR, Moskva.
KSIA (Ukraine)	– Kratkiye Soobshcheniya Instituta Arkheologii Akademii Nauk USSR, Kiev.
KSOGAM	– Kratkie Soobscheniya Odesskogo Gosudarstvennogo Arkheologicheskogo Muzeya, Odessa.
MASP	– Materialy po Arkheologii Severnogo Prichernomor'ya, Kiev.
MIA	– Materialy i Issledovaniya po Arkheologii, Moskva.
SA	– Sovetskaya Arkheologiya, Moskva.
SAA	– Soviet Anthropology and Archaeology, Moskva.
SE	– Sovetskaya Etnografiya, Moskva.

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Vol.1: *Weapons of the tribes of the Northern Pontic zone in the 16th–10th centuries B.C.*, by Victor I. Klochko.

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Orders regarding B-PS should be adressed directly to the Editorial Office (Baltic-Pontic Studies, Institute of Prehistory, Św. Marcin 78, 61-809 Poznań, Poland).

This publication was supported by a grant from the International Research & Exchanges Board, with funds provided by the U.S. Department of State (Title VIII), The National Endowment for the Humanities (NEH), and the John D. and Catherine T. MacArthur Foundation. None of these organizations is responsible for the views expressed.

The publication was partly founded by the University of Łódź and by the Foundation of Adam Mickiewicz University too.

ISBN 83-86094-04-4
ISSN 1231-0344