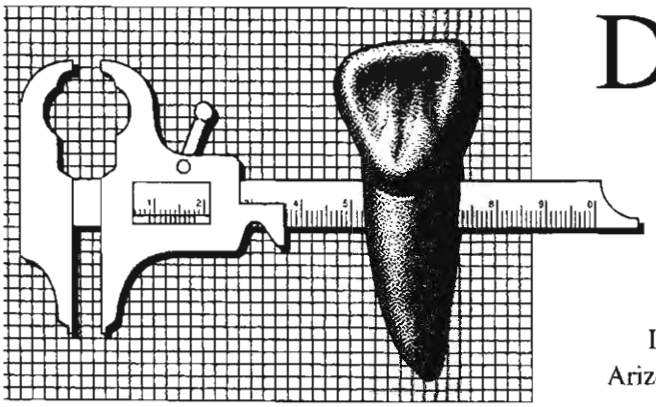

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An Odontometric Investigation of the Affinities of the Nazlet Khater Specimen to Prehistoric, Protohistoric and Modern African Populations

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ABSTRACT This study scrutinizes the affinities of a 33,000-year-old skeleton from Nazlet Khater, Egypt, to various prehistoric African populations. The comparative material consists of 231 individuals, ranging in time from the Middle Pleistocene to recent and restricted in space to the African continent and Southern Levant. Possible affinities were first examined with the application of univariate, and bivariate, statistics. Subsequently, principal components analysis and cluster analysis are performed on mean data from 29 populations, utilizing a selected set of tooth dimensions. The results indicate a strong association between some of the sub-Saharan Middle Stone Age (MSA) specimens and the Nazlet Khater skeleton. No clear discrimination was reached between the various African and Levantine populations. The significant differences between male and female mean data factor scores on the first principal component indicate that sexual dimorphism accounts for a large portion of the observed variability in size.

INTRODUCTION

Comparative studies which attempt to discriminate between human populations on the basis of odontometric data are generally unsuccessful (Kieser, 1990). Comparisons on a tooth-to-tooth basis cannot transcend intra-population variability. Univariate and bivariate statistical analyses that operate on one and two dental measurements, respectively, fail to provide clear discrimination between the populations being studied. However, the introduction of multivariate statistical techniques granted researchers improved methods with which they can: 1) discriminate between populations and individuals based on a large set of dental measurements, 2) allocate a given individual to a specific group/population, 3) study the relationship between the various dental dimensions, and 4) study the role and extent of sexual dimorphism on certain teeth.

This study scrutinised the affinities of a 33,000-year-old specimen from Nazlet Khater, Egypt, to prehistoric, protohistoric and modern African populations based on an extensive set of odontometric data. The analysis was conducted in two steps. First, univariate, and bivariate statistics were applied to a data set of 231 protohistoric and historic specimens from Africa and Southern Levant. The specimens were divided into ten groups based on geographic and temporal criteria. Second, principal components analysis and cluster analysis were performed on calculated mean data for three of the groups and published mean data for 26 African and Levantine populations. The analysis utilized a set of variables (tooth dimensions) that were chosen on the basis of results obtained from the univariate and bivariate analyses. Lastly, this study investigated the effect of sexual dimorphism on the first and second principal components.

MATERIALS AND METHODS

The Nazlet Khater Skeleton

The Nazlet Khater skeleton was found in a narrow grave at the summit of the Nazlet Khater 2 site, during the 1980 excavation season (Vermeersch *et al.*, 1984c). The skeleton was found on its back in an extended position with a bifacial axe underneath its cranium. During the following season, Vermeersch and his team discovered the nearby Upper Paleolithic mining site of Nazlet Khater 4. In 1982, nine C^{14} dates, ranging between 35,100 to 30,360 yrs.

were obtained from hearth structures and four samples from dispersed charcoal (Vermeersch et al., 1984b,c). According to Vermeersch and co-workers (1984a,b,c) the bifacial axe found in the grave of the skeleton is typologically identical to some of the bifacial axes recovered from the nearby Upper Paleolithic mining site of Nazlet Khater 4. Based on such typological association and the obtained C14 dates from the Nazlet Khater 4 site, the skeleton was assigned an age of 33,000 years. Attempts to directly date the skeleton were futile as no collagen was preserved in the bones (Vermeersch, 1984a,c).

COMPARATIVE MATERIAL

The comparative material consists of over 231 individuals, ranging in time from the Middle Pleistocene to recent and restricted in space to the African continent and the Central and Southern Levant. The majority of dental dimensions were collected from the literature. The author measured the teeth of the Nazlet Khater, Ishango B, and Ein-Gev 1 specimens. The Ohalo I, and II measurements were given by Prof. Hershkovitz (1997, pers. comm.).

SELECTION CRITERIA

The main aim was to gather a statistically significant sample of Middle/Upper Pleistocene and Early Holocene specimens from Africa and the Southern Levant (Israel and Sinai) with which the Nazlet Khater specimen may be associated. Lower Pleistocene and early to mid Middle Pleistocene hominids were excluded, as the Nazlet Khater is indisputably anatomically modern *H. sapiens*. The temporal boundary for the inclusion of specimens was set at less than 500 kya (500,000 B.P.). All specimens are either *H. sapiens* or late *H. erectus*. The study also excluded specimens from non-African or non-Levantine geographic locations. In the case of specimens that lacked a secure date, selection was based solely on geographic location.

When possible, specimen measurements were compared between various publications. However, in most cases only one set of measurements were taken and published in the original fossil description or site report. Thus, it was necessary to be as critical as possible in regards to the published measurements. Any published measurements of doubtful accuracy and precision were excluded.

METHODS OF DENTAL MEASUREMENTS

A review of the prevalent odontometric literature indicates the existence of a number of methods of taking tooth size measurements. The most commonly applied technique is that proposed by Moorrees (1957), according to which the greatest mesiodistal dimension of the crown is measured parallel to the occlusal and labial surfaces. The buccolingual distance is then taken as the maximum dimension in a plane perpendicular to the plane in which the mesiodistal diameter was measured (Kieser, 1990). Hillson (1996) points out that this definition is unclear for the

TABLE 1. Measurements of the Nazlet Khater teeth from the original and casts (in mm).

	Mesial-Distal			Buccal-Lingual		
Maxilla	Fossil	Cast	% Difference	Fossil	Cast	% Difference
Central	7.42	7.35	0.94	6.11	5.98	2.13
Lateral incisor	7.16	6.79	5.17	6.27	6.20	1.12
Canine	6.36	6.37	0.16	8.72	7.63	12.50
First Premolar	6.71	6.64	1.04	9.93	9.53	1.04
Second	5.93	6.84	15.35	9.65	9.80	1.55
First Molar	10.53	10.22	2.94	11.93	11.89	0.34
Second Molar	9.60	9.99	4.06	13.01	12.77	1.84
Third Molar	9.60	9.59	0.10	12.70	11.46	9.76
Mandible						
Central	5.02	5.74	14.34	6.55	6.00	8.40
Lateral Incisor	6.21	6.40	3.06	6.46	6.26	3.10
Canine*	5.26			8.34	8.02	3.84
First	6.82	7.22	5.87	8.44	8.26	2.13
Second	6.51	7.21	10.75	8.66	8.84	2.08
First Molar *	11.71	10.29	12.13	11.73	11.88	1.28
Second	11.17	11.52	3.13	11.06	10.92	1.27
Third Molar*	11.16	11.95	7.08	11.16	11.27	0.99

* indicates left tooth measured

case of rotated teeth. In such cases, the measurement of the crown should be taken as though it were in normal anatomical position (Wolpoff, 1971; Hillson, 1986).

The above measuring technique was applied to the Nazlet Khater (original and cast), Ishango B, and the Ein-Gev 1 cast. Measurements were always taken three times in order to reduce intra-observer error. Each of the reported measurements is, therefore, the mean of the three trials. In instances where the difference between the three measurements was considered too large, tooth dimensions were re-measured. Only right dental diameters were used in order to standardize the compiled set of data. In cases in which the right tooth dimensions were unavailable or inaccurate due to the fragmentary condition of the reported fossil or other skeletons or a high degree of dental attrition, the corresponding left tooth dimensions were used instead.

LEVEL OF MEASUREMENT ERROR

A great contention exists regarding the level of error in teeth measurements. Authors, such as Hillson (1996) and Calcagno (1989), suggest an error figure around 0.1 mm, while Wolpoff (1971) argues for a much higher figure of 0.5 mm. However, the level of error is significantly higher in the case of severe occlusal and/or interproximal attrition. Calcagno (1986) noted in his study of dental metric trends of Post Pleistocene Nubian populations, a higher

TABLE 2. Sources of mean-score data utilized in the principal components analysis.

Sample	Location	Period, absolute date	Reference
Sub-Sahara			
Mapungubwe	South Africa	Iron Age	Wolpoff (1971)
Bambandtanalo	South Africa	Iron Age	Galloway (1959)
Sanga	Zaire	Iron Age	Orban *et al.* (1988)
Late Stone Age	sub-Sahara	Late Stone Age	Present data
Middle Stone Age	sub-Sahara	Middle Stone Age	Present data
Teso	Teso, Uganda	Contemporary	Barnes (1969)
Griqua	South Africa	Contemporary	Keiser (1985)
San	South Africa	Contemporary	Keiser (1985)
South African Negro	South Africa	Contemporary	Keiser (1985)
Egypt, Sudan			
Site 117	Jebel Sahaba, Sudan	Late Paleolithic, 12,000 BP	Anderson (1968)
Wadi Halfa	Wadi Halfa, Sudan	Late Paleolithic 8,000-11,000 BP	Green *et al.* (1967)
Late Paleolithic, Nubia	Northern Sudan	Late Paleolithic 12,000-9,000 BP	Calcagno (1986)
Agricultural Nubia	Northern Sudan	A and C groups and Pharonic Horizon 5,000-3,100 BP	Calcagno (1986)
Intensive Agricultural Nubia	Northern Sudan	Merotic, X, and Christian Periods 2,000-600 BP	Calcagno (1986) Rousset (1981-1982)
Soleb	Soleb, Sudan	4065-1,700 BP	Rousset (1981-1982
Mirgissa	Northern Sudan	Middle Kingdom	Rousset (1981- 1982)
Upper Egypt Neolithic	Upper Egypt	Neolithic	Rousset (1981-1982)
North Africa, Sahara			
Afalou-bou Rhumel	Algeria	Epipaleolithic	Caillard (1978)
North Africa Middle Paleolithic	Morocco	Late Pleistocene	Present data
Modern Moroccans	Northern Algeria	Contemporary	Gambarotta (1987)
Upper Capsian	Northern Algeria	Epipaleolithic	Present data
Neolithic Sahara	Sahara	Neolithic	Present data
Near East			
Hatoula	Israel	Neolithic	Smith &Verdene (1994)
Abou Gosh	Israel	Neolithic	Arensburg *et al.* (1978)
T. Mureybeit	Syria	Neolithic	Arensburg *et al.* (1978)
Jerico	Israel	Neolithic	Arensburg *et al.* (1978)
Natufian	Israel	Epipaleolithic	Smith &Verdene (1994)
Levant-Bronze Age	Israel	Bronze Age	Smith *et al.* (1984)
Qafzel	Israel	Middle Paleolithic	Vandermeersch (1981)
Skuhl	Israel	Middle Paleolithic	McCown & Keith (1939

level of observer error for the mesiodistal diameters than for the corresponding buccolingual dimensions. In comparing his results to the previously published measurements by Greene and co-workers (1967), he found an average difference of 1.7% for the buccolingual measurements as opposed to 4.4% for the corresponding mesiodistal dimensions. Calcagno suggested that such variability is the result of different standards regarding the degree of wear between the teeth.

A similar trend was observed in this study in regards to the dental dimensions of the Nazlet Khater specimen. The original measurements were compared to the cast and results are given in Table 1. The percentage of difference is given for each pair of measurements. The average level of error for the maxillary teeth is 3.72% for the mesiodistal diameter, and 3.79% for the corresponding buccolingual diameter. The mandibular teeth have a high average level of error for the mesiodistal diameter (8.05%) and a lower corresponding level of error for the buccolingual diameter (2.88%). The greatest difference is 15.35% for the mesiodistal diameter of upper fourth molar, followed by 14.34% for the mesiodistal measurement of lower central incisor. High differences were also found between the dimensions of the original and cast for the mesiodistal diameters of lower fourth premolars and first molars, and buccolingual diameters of lower fourth molars and upper third molars.

Such discrepancies are the result of one or more of the following factors. Firstly, all the specimen's teeth were in a severe state of attrition. Thus, it often difficult to locate two reliable points on the crown from which the mesiodistal dimension could be measured. Secondly, all of the posterior teeth were subject to dental crowding. Therefore, in the case of some posterior teeth, placement of the sliding calipers between the adjacent teeth was impossible. This resulted in a high level of error for the mesiodistal dimensions of certain teeth. Thirdly, the cast teeth dimensions may be inexact due to their low quality. Therefore, the possibility exists that 1) a much higher level of error occurred for mesiodistal measurements than the level of error for the buccolingual dimensions due to dental crowding and inter-proximal attrition; and 2) the level of measurement error in the case of severely worn teeth fluctuates between 0.3 to 1.4 mm, with an average which is close to the estimate of 0.5 mm proposed by Wolpoff (1971).

STATISTICAL METHODS

The dental metric data set is divided into the following ten groups: Group 1: Africa Middle Stone Age (MSA), Group 2: North African Middle Paleolithic, Group 3: sub-Saharan Late Stone Age (LSA), Group 4: sub-Saharan Iron Age, Group 5: Late Paleolithic / Neolithic Egypt, Group 6: Levant Late Paleolithic / Neolithic, Group 7: Levant Early Moderns, Group 8: North Africa Epipaleolithic / Neolithic, Group 9: Neolithic Sahara, Group 10: Protohistoric Sahara.

Univariate analyses were performed on the groups prior to the application of principal components analysis and cluster analysis. The univariate analyses consist of 1) analysis of variance - One-way and Scheffe Range tests, and 2) non-parametric test - Kruskal-Wallis. Subsequently, the mesiodistal and buccolingual dimensions for a specific tooth were plotted in a bivariate scatter plot. The position of the Nazlet Khater specimen, and other individuals was then marked, and the spread pattern and similarities within and between the various groups were analyzed.

TABLE 3. Mean scores and standard deviations obtained from the principal components analysis.

Tooth*	Dimension	Mean	Standard Deviation
First premolar	Mesial-distal	7.230	0.421
Second premolar	Mesial-distal	9.239	0.414
First molar	Mesial-distal	11.397	0.571
Canine	Bucco-lingual	7.841	0.541
First premolar	Bucco-lingual	8.281	0.547
Second premolar	Bucco-lingual	8.548	0.528
First molar	Bucco-lingual	10.975	0.575

*All lower teeth

TABLE 4. Eigenvalues

Principal Component	Eigenvalue	% total variance	Cumulative Eigenvalue	Cumulative %
1	5.58	79.67	5.58	79.67
2	0.64	9.13	6.22	88.81

The last and central part of the analysis involved the application of principal components and cluster analyses. The multivariate technique of principal components analysis is usually applied for the purpose of data reduction and decorrelation of the variables. However, principal components analysis can also be applied as an exploratory tool in the search for underlying "latent" structures (Harris and Bailit, 1988). In this study principal components analysis is utilized as an exploratory tool for the detection of affinities between the studied individuals/populations. Based on the results of the univariate and bivariate analyses it was possible to choose a subset of teeth

TABLE 5. Factor Loadings (unrotated)

Tooth*	Dimension	Factor 1	Factor 2	Factor 3
First premolar	Mesial-distal	0.891	-0.307	-0.237
Second premolar	Mesial-distal	0.891	-0.365	-0.102
First molar	Mesial-distal	0.925	-0.172	0.157
Canine	Bucco-lingual	0.829	0.446	-0.283
First premolar	Bucco-lingual	0.921	0.250	-0.005
Second premolar	Bucco-lingual	0.949	0.0045	0.113
First molar	Bucco-lingual	0.913	0.125	0.316
Explained variance		5.712	0.536	0.284
Proportion of total		0.816	0.077	0.041

*All lower teeth

dimensions (variables), and as a consequence the dimensions of certain teeth, such as the second and third molars, were excluded due to their poor value as population discriminators. Various trials were conducted on the available subset in order to choose the most powerful discriminatory set of measurements. It was clear from the univariate analysis that only independent variables should be applied since redundancy would increase noise and decrease discrimination between the individuals. Important to note is that maximal discrimination can be best reached in as few variables as possible. The inclusion of a large set of variables increases the role of adverse sampling effects and noise, reducing the discriminatory power of the analysis (Van Vark and Schaafsma, 1992). The final set of variables was selected, as it is believed to provide the best discrimination between individuals from specific geographic locations.

No clear pattern of segregation or clustering was detected among the specimens. However, a large amount of bias was detected in the structure of the data set and is believed to be the consequence of the following factors: 1) The sample size for particular measurements (e.g. incisors) was too small. 2) There is unequal contribution of certain groups to the sample size of a specific tooth dimension. For example, there is hardly any data for the maxillary teeth of the MSA group. Similarly, due to the common practice of dental mutilation among Northwest African prehistoric cultures, no data was available for the central incisor dimensions for the Epipaleolithic/Neolithic North African group. 3) Certain groups were under-represented due to the scarcity of finds. Unfortunately, this difficulty could not be overcome, as the addition of individuals to under-represented groups was not possible.

The best solution was to conduct the statistical analysis on available mean-score data. Mean-score data includes mean scores for three of the groups (North African Middle Paleolithic, Late Stone Age, Middle Stone Age) pooled with mean scores for 26 African and Levantine populations. The archaeological period, absolute date (when available) and geographic location for the various mean scores is given in Table 2. Unfortunately, mean scores for the three groups and the majority of the pooled data is not sexed. Including only sexed data was unfeasible since it would have resulted in a drastic reduction in the number of available mean-scores. Moreover, many of the 'North African Middle Paleolithic', and 'Middle Stone Age' specimens consist of a partial mandible/maxillae which could not be sexed by any reliable sexing technique. However, sexed data was available for seven of the 29 populations and was incorporated into the principal components and cluster analyses.

Subsequently, various trials were conducted on the data set using principal components analysis. The most useful dimensions were found to be those of the lower canine, premolars, and first molar. Including the corresponding upper teeth reduced the effectiveness of the analysis by lowering the cumulative percent of the total variance each component accounted for. As the Nazlet Khater mesiodistal lower canine dimension was unavailable due to the fragmentary condition of the tooth, this variable had to be excluded. At first glance, the buccolingual dimensions seemed more effective than the corresponding mesiodistal dimensions for the detection of variability between the groups, while the mesiodistal dimensions were more sensitive to intra-population variability of size. Notwithstanding, previous results from univariate and bivariate analyses on dental dimensions indicate that mesiodistal dimensions are equally as important for the analysis as buccolingual dimensions, and that the exclusion of mesiodistal variables will diminish the discriminatory power of the analysis.

Several trails were performed utilizing various combinations of variables in a hierarchical cluster analysis. The hierarchical cluster method was the one of Average Linkage (Between Groups), using the Squared Euclidean distance option. Results suggests that the inclusion of a set of variables different than the one applied in the principle components analysis, did not yield better discrimination between the populations. The principal components analysis and cluster analysis on teeth is therefore based on the buccolingual dimension of the lower canine, and the mesiodistal and buccolingual dimensions of the two premolars, and first molar.

RESULTS

Results of the one way analysis of variance and Scheffe test indicate most of the group means for a given tooth measurement were not significantly different at the 95 percent confidence interval level. The only group that appears consistently different than the rest is Group 2. This coincides with the fact this group is the only one that possesses specimens that are not anatomically modern H. sapiens. Results of the Kruskal-Wallis analysis indicate that mean scores for most of the teeth dimensions are different at the 95 percent level of confidence interval. However, the mesiodistal diameter of lower and upper first incisors, second incisors, and third molars, and of the upper third molar, as well as the buccolingual diameter of the upper first incisor are not significantly different at the given confidence interval level.

Tables 3, 4, and 5 provide a summary of the statistical results obtained from the principal components analysis. It should be noted that out of the three components that were extracted, component 2, and 3 have eigenvalues below 1.0. Certain statisticians do not recommend the extraction of components with low eigenvalues. However, since the principle components are only used as an exploratory tool and not for data reduction, the low eigenvalues of these components have little effect on the efficiency of the analysis.

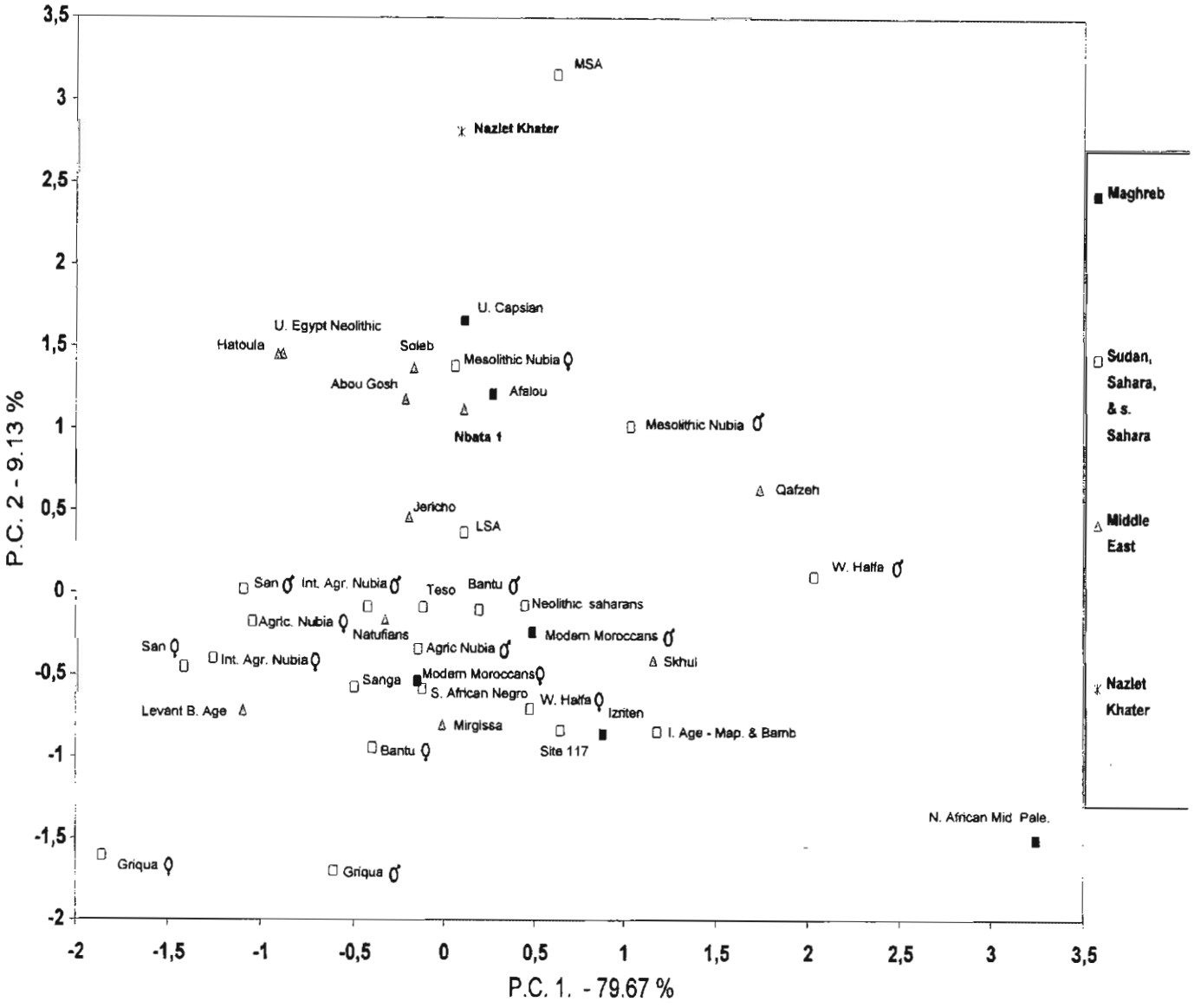

Fig. 1. Principal components analysis of dental dimensions (component 1 and 2).

Figure 1 is the scatter plot of the first and second principal components. In addition to the mean scores, individual data (as opposed to mean-data) for the Nazlet Khater and a Neolithic skeleton from the Egyptian Western Desert - Nabta E-75-8, were incorporated in the analysis. The individual measurements for these specimens were transformed to factor scores through the application of the mean and standard deviations of the factor loadings. The results indicate that factor scores on the first and second principle components (henceforth PC1, PC2, PC3 etc.) of the Nazlet Khater places the specimen close to the mean scores for the MSA group, at the higher end of the graph. The position of Nabta E-75-8 in the center of the graph, far from Nazlet Khater, suggests that the two are not closely associated.

The first principle component mainly accounts for variability in size. The largest mean score on PC1 belong to the North African Middle Paleolithic group (PC1 scores larger than 3.0), while small mean scores for PC1 are those of the Levant Bronze Age and the San female group (PC1-scores smaller than -1.0). The Middle Paleolithic specimens are very robust in their morphology and large in size, while Bronze Age Levantine individuals and contemporary San females are generally gracile and have small dimensions. The second principal component is the shape component. However, it only accounts for a small part of the total variability (9.13%) and does not reveal any clear discrimination or clustering among the studied populations.

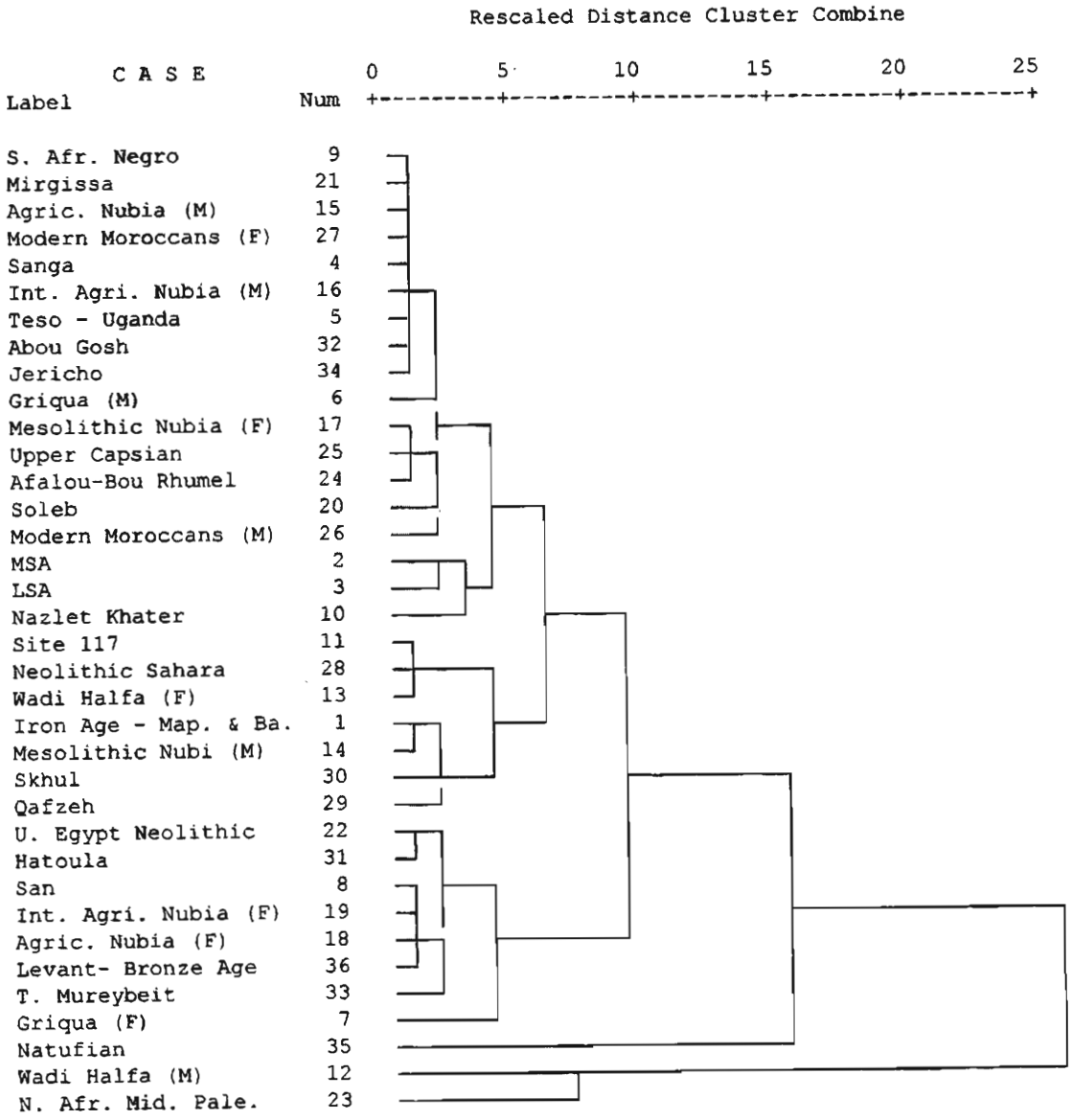

Fig. 2. Results of the hierarchial cluster analysis.

Results of the cluster analysis are presented in Figure 2. It is evident that no clear discrimination was reached between the various populations. Nonetheless, the Nazlet Khater specimen is clustered with the Late Stone Age (LSA) and Middle Stone Age (MSA) mean-scores. This result is in accord with the results of the principal components analysis, since in both analyses the Nazlet Khater specimen is clearly associated with the MSA group.

SEXUAL DIMORPHISM

Figure 3 demonstrates the effects of sexual dimorphism on the first component (size) and the obtained statistical results. The difference between the sexes is clearly noticed along the axis of the first principle component. All male means have higher factor scores than the corresponding female means. Differences between corresponding male and female factor scores, on the second principal component, vary among the populations. Thus, distance between male and female means is large for the Late Paleolithic Nubians, while very small in the case of the modern San people. Altogether, horizontal (PC1 or first principal component) differences are significantly greater than vertical (PC2 or second principal component) differences, indicating that PC1 is the size component and PC2 is the shape component.

DISCUSSION

The results obtained from the principal components and hierarchical cluster analyses indicate that the various African populations cannot be discriminated on the basis of teeth dimensions alone. Falk and Corruccini (1982)

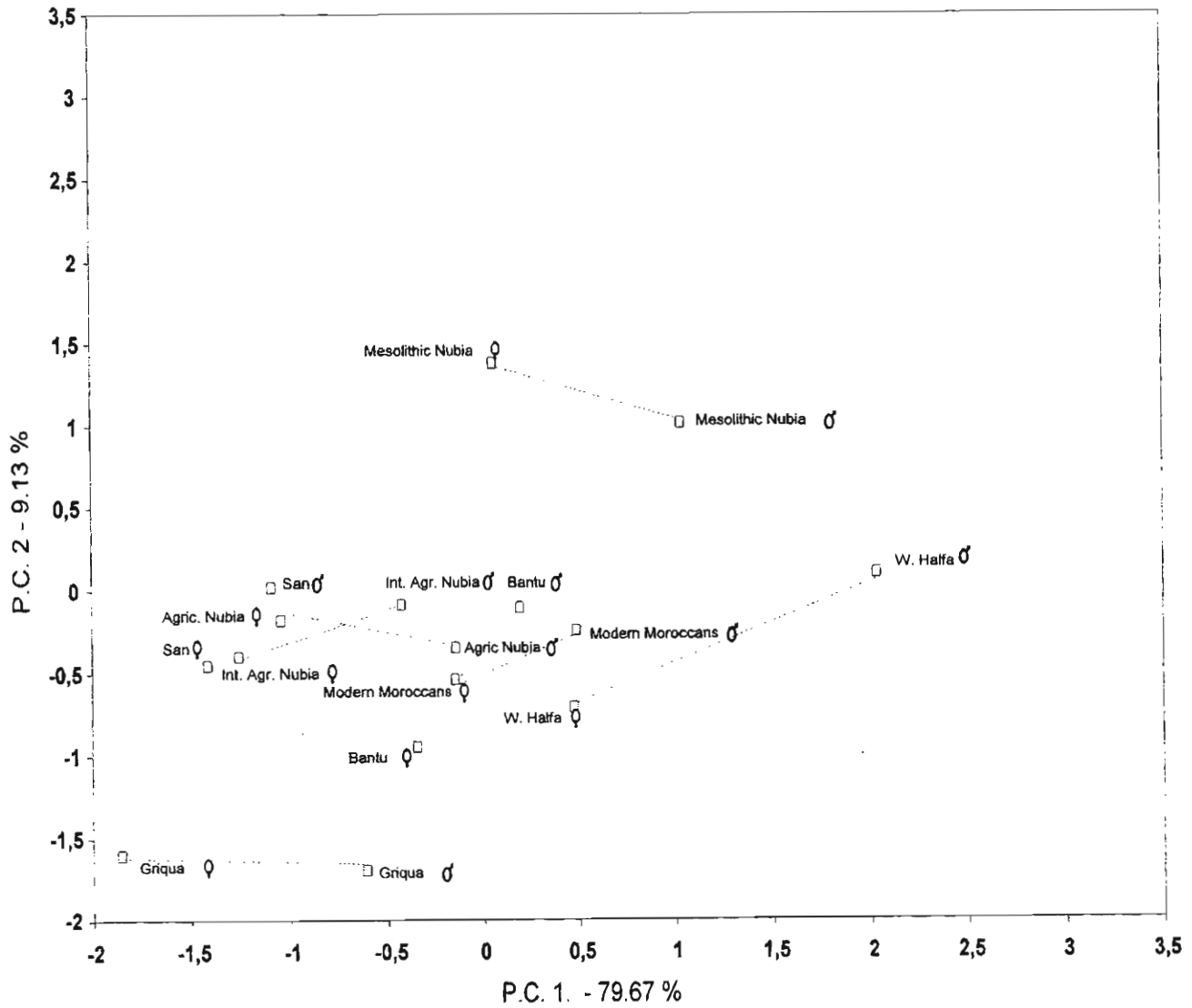

Fig. 3. Sexual dimorphism among some of the studied populations.

obtained similar observations. Falk and Corruccini compared the efficiency of 'traditional' and 'non-traditional' cranial measurements to that of measurements of length and breadth of crown and root dimensions for upper canine, second premolar, and first molar (C, P4, and M1, respectively). Their statistical sample included one hundred skulls (in total), consisting of five major populations: blacks and Caucasians from the Terry collection, and Inuit, Mongolians, and Amerindians all housed in the U.S. National Museum of Natural History. According to Falk and Corruccini cranial measurements are far more effective for the analysis of population affinities. Consequently, Falk and Corruccini propose the following speculations: 1) tooth information may be more redundant because of correlation; 2) tooth size may be less heritable than generally thought; 3) perhaps teeth are less indicative of the major processes which enable the differentiation of races; and 4) teeth may be subject to a higher level of error than cranial measurements due to their ill-defined landmarks.

Some of the above speculations may be correct. Yet, this study yields a clear separation between the MSA and Nazlet Khater on one hand and the rest of the studied populations on the other. Moreover, identical separation was reached with the utilization of mandible measurements (Pinhasi, 1996). The strong association between the Nazlet Khater and MSA specimens is thought provoking. Thoma (1984), who originally studied the skeleton, was unable to pinpoint the specimen's affinities. However, Thoma did state that many of the morphological features of the Nazlet Khater are found among the Late Paleolithic Nubian skeletons from Wadi Halfa and Jebel Sahaba. Yet, Thoma did not further investigate possible affinities with sub-Saharan specimens and his argument relies on general morphological features that are present among any prehistoric population.

Bräuer and Rimbach (1991) attempted to affiliate the Nazlet Khater specimen with late archaic and modern H. sapiens from sub-Saharan Africa, Upper Paleolithic Europe, and Northern Africa, based on two discriminant analyses of craniometric variables. The first discriminant analysis was based on eight facial variables. In this analysis the Nazlet Khater is positioned within the 90% ellipse of the North African group, but closer to the sub-Saharan circle than to the European Upper Paleolithic circle. In the second analysis, which was based on vault variables, the Nazlet Khater is placed within the sub-Saharan 90% circle. Bräuer and Rimbach (1991) assert that while such a position is remarkable, one should not overlook the fact that there is a great area of overlap between the Upper Paleolithic European and the sub-Saharan samples for the vault variables. However, the inability to successfully discriminate between the three groups may be affected by small sample sizes (N (12 for the face and N (16 for the vault analysis). Moreover, it is questionable whether individuals from Morocco, Chad, Sudan and Egypt, could have ever belonged to a common ancestral stock. The Sahara would have restricted the possible amount of gene flow between Northwest Africa, and the Nile Valley and it is therefore highly unlikely that the observed overlap between the groups is any indication of the true range of variation within and between European, North African, and sub-Saharan populations.

CONCLUSIONS

In sum, no clear discrimination pattern was achieved between the various populations. Nonetheless, the position of the Nazlet Khater next to the MSA group and away from the rest of the mean scores is thought provoking. Similar results were obtained from the principal components analysis of the affinities of the Nazlet Khater specimen, based on a large set of mandibular dimensions (Pinhasi, 1996). As the Nazlet Khater was only indirectly dated, it is possible that the individual is from the last interglacial period (125-60 kya) and thus much older than its assigned age of 33 kya.

Finally, the statistical results imply that multivariate analysis on odontometric data should take into consideration the impact of sexual dimorphism on intra-population variability. It is not always possible to successfully sex prehistoric specimens, mainly because they are usually in an incomplete and fragmentary condition. Nonetheless, skeletons should be sexed when possible. Studying sexed, rather than unsexed data, will reduce the intra-population variability of size, and increase the discriminatory power of the statistical analysis.

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Another Talon Cusp: What Does It Mean?

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Recently, Triona McNamara (1997) published in *DENTAL ANTHROPOLOGY* an interesting note on a rare feature she had found on the labial surface of a lower central incisor in a young Caucasian male. In her communication she also solicited comment on this feature, called talon cusp, which is the reason for the present note. I have seen several of these incisor labial structures during my on-going world survey of modern human crown and root morphological variation, but only rarely did I take the time to photograph any examples, nor have I systematically made observations on their occurrence and form. This note provides one of my very few such photographs, which I will discuss in a moment.

In McNamara's literature review of talon cusps, she found that they occur most often on the permanent upper lateral incisors, and based mainly on two articles, that they seem to be associated with incisor shoveling, peg-shaped lateral incisors, unerupted canines, three-rooted lower first molars, impacted mesiodens, and odontomes (McNamara, 1997:19).

Studies of worldwide human dental variation have shown that shoveling, three-rooted lower first molars, and odontomes are characteristically found in Asians and populations of relatively recent Asian-derivation such as Native Americans, Polynesians, and Micronesians (Scott and Turner, 1997). Peg-shaped incisors are probably more common in Western Eurasians than in other modern human groups. The frequencies of unerupted canines and impacted mesiodens around the world and in the past are largely unknown. Hence, the associations of incisor talon cusps would suggest they are perhaps more likely to be found in Sino-Americans and Sunda-Pacific populations than in other dentally-defined major human groups (Scott and Turner, 1997). As the dental pattern associated with Sino-Americans seems to have evolved by at least the time of the Chinese Choukoutien Upper Cave skeletons (ca. 30,000 B.P.), then incisor talon cusps might also be expected to be found in late Pleistocene examples of Sinodont teeth. As there are

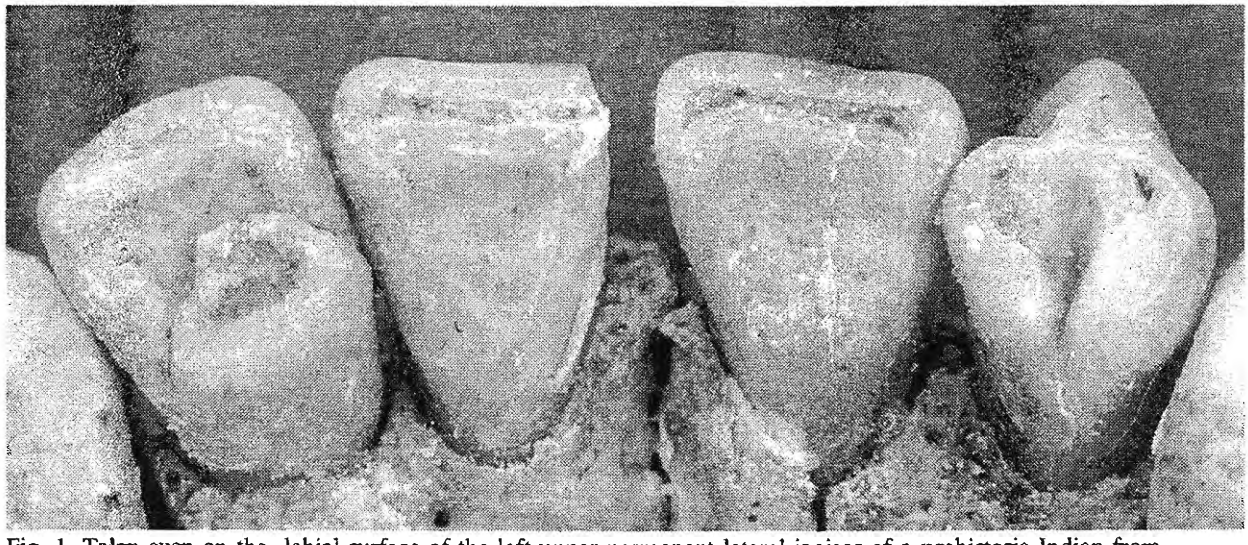

Fig. 1. Talon cusp on the labial surface of the left upper permanent lateral incisor of a prehistoric Indian from Petrified Forest district, northeastern Arizona. Right lateral incisor has large tuberculum dentale. Smithsonian Institution, National Museum of Natural History 213333.

very few teeth of such antiquity from northeast Asia, and none exhibiting talon cusps, the only source of information on these interesting structures must come from observations of derived later populations.

Archaeology, dentition, most genetics, other physical anthropological characteristics of Native Americans, and natural history overwhelmingly point to far northeast Siberia as their proximate ancestral homeland. Artifact and biological similarities in northeast Siberia and Alaska demonstrate that their route to the Americas was across the now-submerged Bering land bridge. Inasmuch as no convincing evidence has been found for human occupation of Alaska before 12,000 years ago, and no earlier than 15,000 for northeast Siberia (West, 1996), then the following example of a prehistoric Sinodont American Indian with an incisor talon cusp would suggest that the trait and its morphogenetic development process is at least 12,000 years old, assuming that it was brought by the Paleo-Indian population that initially colonized the New World. This assumption is not unreasonable given that there is no known morphological feature in Native American dentitions that has not been found in greater or lesser frequencies in the Old World. Thus, it is unlikely that incisor talon cusps found in Native Americans are due solely or even mainly to post-colonization mutations.

Fig. 1 shows the upper permanent incisors of a prehistoric American Indian excavated in the first part of this century by Smithsonian Institution archaeologist Walter Hough in the Petrified Forest district, northeastern Arizona, as part of the Museum-Gates Expedition. The skeleton (213333) is curated in the National Museum of Natural History, Washington, D.C., and is that of a young adult female. The central incisors have only moderate shoveling, while the laterals have stronger expressions, although not symmetrical because the right one has a very large *tuberculum dentale*, whereas the left one has none. The left lateral incisor, however, has a pronounced talon cusp giving the tooth a decidedly triangular cross-section. This condition should not to be confused with the T form or triform variants of the upper permanent lateral incisors (Bailey-Schmidt, 1995; Bailey, Turner, and Williams, 1997), which are forms that are found on the lingual surface in conjunction with *tuberculum dentale* expression. There is no talon cusp on the right lateral incisor.

The phylogeny of upper lateral incisor variation, especially *tuberculum dentale* and its highly variable expression, remains as baffling as any other crown or root trait that I know of. Now, does the talon cusp need to be considered as part of that evolution? At times I have thought that *tuberculum dentale* represented some manner of the ancestral mammalian third incisor, but always in the end the idea was abandoned because the lower incisors lack comparable lingual surface morphology. McNamara's finding of a lower incisor talon cusp suggests that it might be useful to reconsider the third incisor-*tuberculum dentale* idea. This possible link might be enhanced if it could be shown in a quantitative fashion that lower incisor talon cusps occur significantly more often on the central than on the lateral incisor—the reverse of *tuberculum dentale* following the fact that lower central incisors are congenitally absent more often than are the laterals. Is the lower incisor talon cusp the counterpart of the upper incisor *tuberculum dentale*, and

are both some manner of reversed residual expression of the ancestral mammalian third incisor? Like McNamara, I too would appreciate comments on the talon cusp, particularly as they might bear on the notion of "atavistic" third incisor expression.

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West FH (editor)(1996) American Beginnings: The Prehistory and Paleoecology of Beringia. Chicago: University of Chicago Press. very few teeth of such antiquity from northeast Asia, and none exhibiting talon cusps, the only source of information on these interesting structures must come from observations of derived later populations.

DENTAL ANTHROPOLOGY AT THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA

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Researchers in the bioarchaeological lab directed by Phil Walker at the University of California, Santa Barbara are involved in many interesting dental anthropological projects. Currently, the lab is home to five graduate students and one post-doctoral researcher. Ongoing projects include dental studies of skeletal collections from the Santa Barbara Channel area, Peru, and Chile, forensic work on modern homicide cases, and the creation of instructional CD-ROMs on human evolution and dental anatomy.

Susan Kerr Siefkin's master's degree thesis centered on the association between dental trauma and diet in prehistoric hunter-gatherers. She compared dental trauma between two societies, one that focused on marine resources and one that focused on terrestrial resources. Susan found no significant differences in the rates of dental trauma between these two groups, which suggests that the relationship between diet and dental trauma is more complex than previously assumed. However, the difficulty she found in comparing these two populations with other published studies on dental trauma led to her creation of an exacting method for scoring dental trauma. This method divides the tooth crown into segments and places emphasis on the exact location of chips or fractures in order to define dental trauma with more precision.

Susan is currently finishing up the data collection phase of her dissertation research on the population history of the prehistoric population of San Nicolas island, one of the southern Channel Islands. She is studying the health status of the Native Americans who lived on the northern and southern Channel Islands with financial support from the U.S. Navy. She is comparing the health, diet, and activity patterns of the San Nicolas Islanders with data that Walker and his coworkers have previously collected on material from the Northern Channel Islands and mainland. Her goal is to place temporal variation in the health of this marginal island population within a broader geographical context. Dental anthropological aspects of this research include the reconstruction of diet through studies of dental pathology and the analysis of population affinities through the analysis of non-metric dental traits. Two additional graduate students are doing master's thesis research as part of the San Nicolas Island project.

Georganna Hawley is using data on non-metric traits and Geographical Information System techniques to test hypotheses about relatedness, burial proximity, and activity patterns. She also plans to take radiographs of all of the San Nicholas specimens to obtain data on tooth development and congenitally missing teeth.

Bonnie Yoshida is focusing her master's thesis research on the dental pathology and dental morphology of the San Nicolas population. By comparing these people with the inhabitants of the other Santa Barbara Channel Islands, she will test a series of hypotheses about diet, gender roles, and status differentiation. This summer, Bonnie plans to begin working on her Ph.D. dissertation, which will be concerned with Peruvian skeletal collections from Moche archaeological sites.

Corina Kellner has just completed her master's degree work on an historic period (1780s-1830s) Chumash Indian skeletal collection from an inland site near Ojai, California. She used dental pathology to study the effects that Spanish

colonization had on the diets of Indians who continued to live in their native villages. This population is interesting because they continued to live in their native village during an extremely stressful period of rapid acculturation. Corina discovered that the diet of this and other historic period populations showed geographical variation linked to local ecology that is similar to that of their hunter-gather ancestors. She found indications of sex differences in dental pathology. Relatively high rates of carious lesions among Chumash men, along with historical documents and the presence of European artifacts at the site, seem to suggest that men from this village worked for the European colonists as agricultural laborers. Corina plans to write her Ph.D. thesis on Peruvian collections from Nasca.

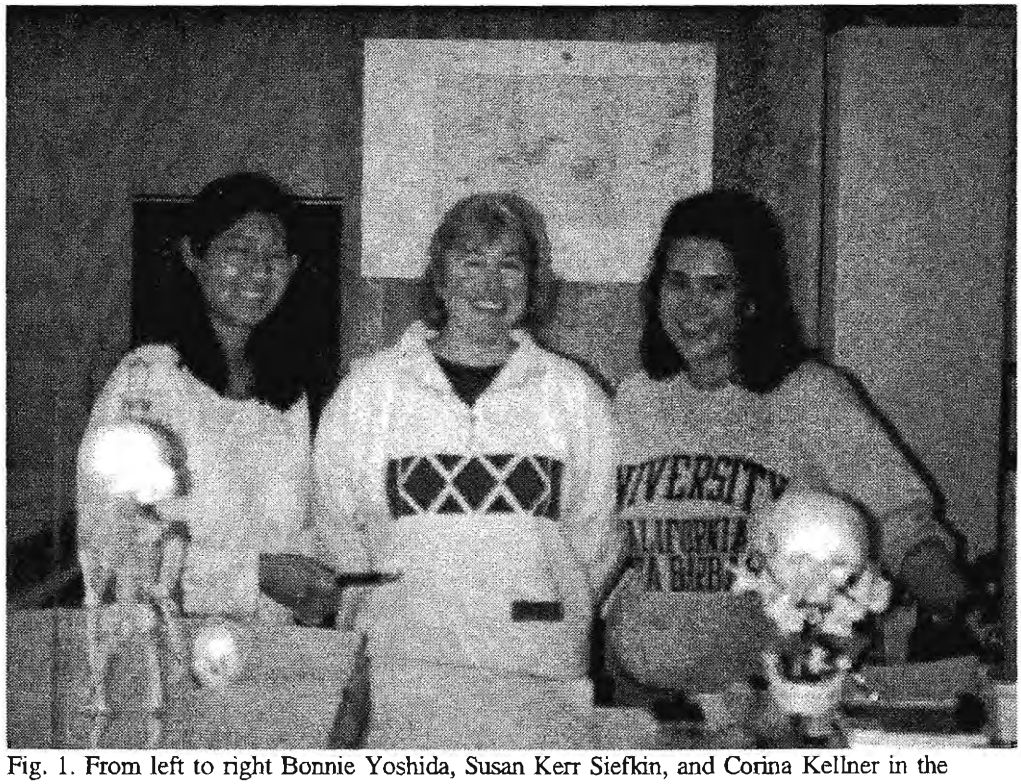

Fig. 1. From left to right Bonnie Yoshida, Susan Kerr Siefkin, and Corina Kellner in the Bioarchaeology Laboratory at the University of California, Santa Barbara

Another graduate student is Francine Drayer. She is in the midst of dissertation field work in the highlands of Peru.

Kevin W.P. Miller, a post-doctoral researcher who recently received his degree from Cambridge University, is working with Phil Walker on a series of interesting projects relating to the chemical composition of bones and teeth. Miller is an expert in techniques for extracting biomolecules from calcified tissues. Walker and Miller are applying these techniques to forensic cases as well as to archaeological collections from Iceland, Russia, Cyprus, and California. Most of this work involves the extraction DNA and other biomolecules from teeth. Miller and Walker are especially interested in using this bimolecular evidence to study ancient disease and prehistoric population movements.

Christina Torres will write her master's thesis on a prehistoric population of sedentary, agri-pastoralists from Northern Chile. She plans to use data on dental pathology and cranial deformation to test hypotheses about social status and core-periphery relationships. This population is interesting because it interacted with the larger state polity of Tiwanaku, based in Bolivia.

Ed Hagen and Phil Walker have been working on two CD-ROMs for classroom use. They are currently converting their "Human Dentition" program into a new format that will run on IBM computers. The program is designed to teach students to identify any tooth in the human dentition. Students can rotate photorealistic images of each tooth and view them from any angle. The CD contains text and illustrations that point out various diagnostic of permanent and deciduous teeth. Plans are underway to expand the clinical content of the program in collaboration with Dental Anthropology Association President Elect, John Mayhall. Information on the "Human Dentition" software can be obtained at: http://www.sscf.ucsb.edu/~hagen/hds.html.

Ed and Phil have also just finished *HUMAN EVOLUTION: A MULTIMEDIA GUIDE TO THE FOSSIL RECORD*, an instructional program for both Macintosh and PC that is being distributed by W.W. Norton & Company. This CD uses 3D, photorealistic images of fossils to teach students about ten important milestones in human evolution, from the appearance of the primates to the demise of the Neanderthals. Students can view over 30 fossil and modern skulls,bones, and artifacts, viewing them from any angle at three magnifications. The text and photos illustrate the anatomical differences between the members of the human lineage, including prosimians, monkeys, apes, and hominids. Students can obtain definitions of technical terms simply by clicking on the word. Information on the "Human Evolution" software can be obtained at: http: / /www.wwnorton.com/college/anthro/evolved/multi.html.

Book Review

THE ANTHROPOLOGY OF MODERN HUMAN TEETH: DENTAL MORPHOLOGY AND ITS VARIATION IN RECENT HUMAN POPULATIONS. By G. Richard Scott and Christy G. Turner II. Cambridge: Cambridge University Press, Cambridge Studies in Biological Anthropology. 382 pp. ISBN 0 521 45508 I (hardback)

Flaws and all, this is a splendid and admirable production. Basically it represents the methods and their application pioneered and pursued by its second author, Christy Turner, over the last thirty years. The only real regret one can have is that Christy's long-term partner, Jackie, is not here to savor its appearance in print. Her patient and enduring efforts played a major part in making its main contribution possible. Over two dozen tooth crown and root traits were graded, and their states were evaluated in more than 30,000 individuals. This is the kind of massive investment in time and effort that we are unlikely to see again, and it has produced a compilation that can be used with profit by anthropologists everywhere. It is a landmark demonstration of what dental anthropology can contribute, and the background flaws in conceptual orientation are completely unrelated to the marshaling and treatment of the data contained.

The enduring core of the volume is to be found in Chapter 5, "Geographic variation in tooth crown and root morphology," with mean and standard error bars for each of 20 different local human groups for each of 23 different crown and root features. That means 23 figures each with 20 bars. Even when their higher order attempts at generalization and group association are clearly wrong, the graphic means of presentation is as easy to read and use as one might wish. Appendix B lists the separate published sources used in compiling the data—that is, sources beyond the massive amounts of information accumulated principally by Christy Turner himself. The rest of the sources consulted are added in a bibliography extending another 33 pages.

Chapters 1 to 4 set the stage. The first chapter presents a succinct history of the study of dental morphology. The second describes in clear and straightforward fashion the crown and root traits assessed and presents the basis for their classification. It ends with a fine treatment of the degree of "error" that occurs with repeated assessments of the same specimens, and with the assessments by different observers of the same material. This makes a fine case for the reliability of the procedures they use.

Chapter 3 deals with "Biological considerations; ontogeny, asymmetry, sex dimorphism, and intertrait association." This includes a fine digest of dental embryology and post-natal growth and differentiation, although, since this is not meant as a text in dental development, it is more in the nature of showing roughly when and how the traits to be used actually develop than as a manual laying out that timing in detail. The references are there for those who might want them. The questions raised by the assessment of fluctuating asymmetry and how to handle it are thoughtfully treated and they state a preference for using individual count rather than side count for assessing trait status, showing that it really does not make any difference when treating a specific phenomenon such as the Carabelli trait.

In their treatment of intertrait association, the authors compare the various approaches used—presence/absence, ranked scales, and direct measurements—and show that they all produce the same results. They include tables of coefficients of correlation, but most interesting is the listing and discussion of the highest loadings of the first 12 principal components on an analysis of 14 morphological traits on 31 teeth. As they note, crown size and morphology "interact weakly, if at all" (P. 126), but that observation simply notes the hereditary ties between traits within the individual organisms and not the nature of the ties that are the result of a parallel trajectory through time as documented separately by Alexander Zubov and by John Frisch many years ago. This foretells one of the flaws that will be treated later.

The hereditary nature of the traits they use is expanded upon in Chapter 4: "Genetics of morphological trait expression." This unwittingly shows the frustrations felt by dental anthropologists starting with the expansion of the neo-Darwinian synthesis in the 1930's when hopes were raised that tooth crown and root details might be reflections of simple control. Vestiges of that "black box" faith in the nature of gene action are still obvious in their treatment, but the authors transcend this with a very valuable survey of the literature that shows that dental traits are legitimately inherited, even if not as the single-gene phenomena that serologists and others have regarded as the standards for treating population relationships and the basis of their scorn for those who have tried to deal with morphology. The authors' consideration of the often misunderstood concept of heritability is on solid grounds.

The two chapters after the succinct presentation of that mountain of valuable evidence in Chapter 5 are devoted to the effort to make some kind of sense out of their findings in world perspective. Certainly the effort is well worth

making, but the more they try the more messy things get. Actually, the efforts to put the New World into perspective in the light of the Old works quite well, but they have their problems with the Old World. Chapter 6: "Establishing method and theory for using tooth morphology in reconstruction of late Pleistocene and Holocene human population history," makes the case that dental traits can largely be treated as neutral and used without regard to the likelihood of change in the recent past. In their treatment of theory, the authors do not mention why this makes their approach so successful in dealing with the relationships that share a relatively recent common origin but so questionable when applied to those separated by relatively longer intervals of space and time.

Then Chapter 7: "Tooth morphology and population history," tries to apply the authors' approach to building a quantified picture of the relations of a set of populations representing the spectrum of geographic settings in which living humans are to be found and in the light of what we know of when the various parts of the earth were settled. This is followed by an "Epilogue" that makes brief bows to the deciduous dentition, the hominid fossil record, and the use of dental morphology for forensic purposes. The most useful part of the Epilogue is the discussion of dentochronology. The application of this to the question of the timing, identity, and relationships of the first inhabitants of the New World is eminently satisfying as it has been over the years it has been developed by Christy Turner.

This application illustrates the main strength of the book, and remains true and unaffected by the flaws that need to be noted. There are two realms that suffer from limitations of perspective, and together they combine to cast major doubts on the use of the available material in eastern Asia to make sense out of population history in that part of the world and, to an even greater extent, elsewhere. On the one hand, there is a failure to consider the nature of the archaeological and historical evidence for the course of cultural developments in East Asia, and on the other hand there is a comparable failure to consider key aspects of the human biological evidence—including dental dimensions. Both of these bear on the framing and utility of the concept of "Sundadonty." The population history of eastern Asia over the last 7,000 plus years has all been of expansion southwards made possible by the population growth that followed the development of agriculture initiated in the Chinese Neolithic. There is virtually no archaeological support for a movement north from Sundaland to the Japanese archipelago, nor does the available evidence give any hint at a cultural dynamic that would make such a direction of movement plausible.

The evidence of human biology is also against it. The Ainu of Japan, putative representatives of Sundadonty at its northernmost extent, have less skin pigment than their Japanese neighbors, which could hardly be the case if their long-term original home was practically right on the equator. Conversely, the living people of peninsular and island Southeast Asia are all markedly lighter in color than the long-term dwellers at that latitude in New Guinea, southern India and Africa, although they are darker than their morphological relatives to the north of the tropics. This is not only consistent with the evidence for the spread southward starting with the Chinese Neolithic, but it is just what one would expect if temperate zone farmers had spread southwards absorbing a sparse indigenous sprinkling of heavily pigmented hunter/gatherers. Scott and Turner briefly try to dismiss the phenomenon of essentially temperate-zone levels of skin in the East Asian tropics as the consequences of sexual selection and genetic drift, but the effort is unconvincing. Then there is the genetic evidence recently summarized by Omoto and Saitou that the living Ainu are more closely tied to the populations of Northeast rather than Southeast Asia.

The final piece of evidence that weighs against a Sundaland origin for the Jomon and the Ainu of Japan is an aspect of dental variation that is completely left out of *The Anthropology of Modern Human Teeth*, and this is the basic matter of sheer tooth size. The Hoabinhian samples of Southeast Asia on which the concept of Sundadonty was based have teeth that are as much larger than the teeth of the Early Jomon of Japan as the teeth of the "classic" Neanderthals of Europe are larger then their earliest Upper Paleolithic successors, and yet the Hoabinhian and the Early Jomon are virtual contemporaries. Hoabinhian teeth are 20% larger on the average than Late Jomon teeth, and a reduction of that extent would have taken 20,000 years to have been accomplished at post-Pleistocene rates which have only been in effect for a maximum of 10,000 years. In fact, they take it as a given that there is little evidence for adaptive change during the past 20,000 years although they make no effort to document their assumption.

What this points up is that a consideration of the effects of evolution are largely absent from *The Anthropology of Modern Truman Teeth.* Scott and Turner do consider the possibility that reductions in cusp number may be related to reductions in jaw and tooth size but only in a speculative sense without any effort to check actual instances where this can be tested. There is no attempt to review the available evidence from the human fossil record. Their characterization of European tooth form as displaying hypocone and hypoconulid reduction in distal molars and an

absence of shoveling on incisors would be quite different if they had included the perspective of Early Upper Paleolithic European teeth. Nor do they consider the fact that the Sinodont pattern, presumably a derivative of a southern Sundadont predecessor, is evident in the Zhoukoudian *erectus* material of at least 400,000 years ago and for the North Chinese Neanderthal, Jinniushan, of about half that age. There are many more gaps in the picture of the Far East, but the coordination of cusp reduction, lingual tubercle (*tuberculum dentale*) disappearance, and measurable crown size reduction is parallel to that demonstrated by the more extensive record available in the West. If one can get a modern European dentition out of an Upper Paleolithic predecessor 30,000 years ago with shovel-shaped incisors, four cusps on all upper and five on all lower molars, then there should be no problem getting a Jomon or an Ainu pattern out of something like the Sinodont pattern attributed to the Upper Cave at Zhoukoudian, also about 30,000 years ago. And the Upper Cave at Zhoukoudian has a craniofacial configuration that is metrically indistinguishable from the Minatogawa specimens in Okinawa, the Jomon and Ainu of Japan, and the Polynesians of Oceania, but not the living inhabitants of Southeast Asia. Even if the authors did not have the time or the opportunity to check the relevant specimens first hand, the information is all available in print.

By and large, the absence of a concern for evolution does not hinder their ability to assess the relationships of populations that have only been separated since the end of the Pleistocene 12,000 years ago—their own date for establishing the dentochronology they present. This works just fine for testing the divergence of Amerinds from their putative Asian relatives, but when it dates the Europe/Sri Lanka split to the Bronze Age, something is wildly out of whack. Equally bizarre is the conclusion that the split between the European and the Amerind condition dates to 50,000 and that the African/Amerind split was only 60,000 years ago.

In summary, this book is a masterly presentation of the spectrum of dental morphology displayed in the living human populations of the world, and an awesome compilation of the available information. Readers can use this on their own with great profit, and the techniques by which the assessments were made are so clearly laid out that anyone could follow them and make their own additions should they so wish. The application to an understanding of the relationships of the aboriginal inhabitants of the Western Hemisphere is sound and plausible and fits comfortably with what we know from archaeology and linguistics. However, the attempt at an application to understand the relationships and history of the peoples of Asia and the Pacific is at odds with what we know from genetics, craniofacial morphology, culture history and archaeology. Finally, the attempt to deal with European and African manifestations produces results that threaten to make the whole approach seem ludicrous. The problem, however, is not in the assessment of dental morphology which is as sound as it can be. The problem stems from an inadequate control of the archaeological and paleoanthropological data and a complete absence of the perspective of evolutionary biology. In spite of these flaws, the book can stand as a landmark in dental anthropology.

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DENTAL ANTHROPOLOGY ASSOCIATION SECTION

Recent Books by Dental Anthropology Association Members

Compiled by A.M. Haeussler

INTRODUCTION TO THE PRIMATES by Daris Swindler and illustrated by Linda E. Curtis chronicles our continuing interest in our closest nonhuman relatives and our growing understanding of them. After establishing the principals of taxonomy and the requirements for classification as a primate, Swindler provides a detailed description of the major primate groups and their environments, from the smallest lemurs of Madagascar to the gorillas of Central Africa. He compares and contrasts the primate species, looking at each with a specific anatomical focus: blood groups; the skull; teeth; diet and digestion; the brain and the senses; the skeleton and locomotion; and growth and development. Swindler also considers primate behavior and its close connections with environment and evolutionary differences as well as the fossil record as traced through dental evidence.

The book is an introductory text that is readable and accessible for dental anthropologists as well as beginning students of primates. It will be published in June, 1988, by the University of Washington Press, P.O. Box 50096, Seattle, Washington, 98145-5096, U.S.A.

DENTAL ANTHROPOLOGY. Fundamentals. Limits and Prospects, edited by Kurt W. Alt, Friedrich W. Rösing, and Maria Teschler-Nicola, gives a comprehensive overview of the discipline of dental anthropology. It provides a basic introduction, as well as a reference, for the specialist in anthropology, forensics, ecology, paleontology, and dentistry. Most of the topics are new, especially the synthesis. The literature is derived from a broad international and multi-lingual base. The book was printed by Springer (175 Fifth Avenue, New York 100010, NY, U.S.A.; and Heidelberger Platz 3, D-14197 Berlin, Germany). It was published 1997 and has the ISBN number: 3-211-82974-1.

ODONTOLOGIC KINSHIP ANALYSIS by Kurt W. Alt contains information on the theoretical and practical aspects of the application of odontological traits to relatedness. Among the aims of the study are the identification and selection of odontological traits most suitable for kinship analysis and the search for adequate statistical approaches for the validation of the results comprise a second major issue. As a result his investigations, Alt presents different approaches for the detection and validation of kinship structures in human dental remains. The trait class introduced in the book is a substantial complement to the methodological scope of kinship analysis, especially since trait selection, registration, and evaluation have been standardized. Applications of Alt's method showed that, given an intense cooperation of all scientific disciplines involved, insights into kinship and social structures of pre- and proto- historic populations are possible. The identification of unknown bodies of victims of civil mass disasters, and of individuals from mass graves of the recent past present a possible field of application of Alt's method in the forensic sciences. The book was published in 1997 with an ISBN number of 3-437-25248-8. The publisher was Gustav Fischer at SFG-Servicecenter Fachverlage, Holzweisenstrasse 2, D-72127, Germany.

BIOARCHAEOLOGY: INTERPRETING BEHAVIOR FROM THE HUMAN SKELETON by Clark Spencer Larsen was published by Cambridge University Press in 1997. The book focuses on the human component in the biological record by dealing with the relevance of skeletal remains to the study of the human condition and human behavior. In particular, the book explores how dental and skeletal tissues from archaeological settings reveal life history at both the individual and population levels. According to Larsen (Personal communication, 1998), the unifying theme of the book is behavioral inference, in which he considers behavior in a wide perspective. As a result, Larsen examines physiological stress, exposure to pathogenic agents, injury and violence, and physical activity, as well as topics of special interest to dental anthropologists: dietary and non-dietary uses of the face and jaws, and dietary reconstruction and nutritional inference. Examples in the book are slanted toward studies dealing with North America since that Larsen's geographic area of expertise, but he uses data from other continents to illustrate key topics. The book s Number 21 in the Cambridge Series in Biological Anthropology. Additional information can be found on the World Wide Web at http://www.cup.cam.ac.uk.

THE ANTHROPOLOGY OF MODERN HUMAN TEETH DENTAL MORPHOLOGY AND ITS VARIANTS IN RECENT HUMAN POPULATIONS (ISBN 0 521 45508 I) by G. Richard Scott and Christy G. Turner was published in the spring of 1997. For Dental Anthropology Association Members who wish to learn how to obtain the book, the publisher, Cambridge University Press is located at The Edinburgh Building, Cambridge CB2 2RU, United Kingdom; 40 West 20th Street, New York, NY 10011-4211, U.S.A.; and 10 Stamford Road, Oakleigh, Melbourne 3166, Australia. A review of the book begins on page 14.

DIGITAL CALIPERS AND SOFTWARE

BERNARDO ARRIAZA
Department of Anthropology, University of Nevada, Las vegas, Las Vegas, NV 89154-5012, U.S.A.

I have found a digital caliper system that is working. The system consists of 1) a digimatic caliper (Mitutoyo 165 US$), 2) a digimatic multiplexer (MUX-10 650 US$), 3) a connector cable (caliper-Multiplexer 30 US$), a connector cable Multipler RS232 to connect the MUX-10 to a personal computer (125 US$), 5) software named PAL-Software Wedge for Windows (215 US$), and Excel Software. The total is about US$ 1,100.

The idea is that you set the parameters in such a way that when you activate the digital caliper all the measurements immediately go to Excel. The system is fun. I am using it for teaching, but I think that it can be of great use for dental measurements.

ANNUAL MEETING OF THE DENTAL ANTHROPOLOGY ASSOCIATION

The annual meeting of the Dental Anthropology Association will be held at 6:30 p.m. on Thursday April 2, 1997. It will take place at the Hilton Hotel in Salt Lake City, Utah, U.S.A., concurrently with the Annual Meetings of the American Association of Physical Anthropologists. The room in which the meeting will take place will be indicated in the program, which will be published in the issue of the *JOURNAL OF THE AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS* that contains the abstracts. Among the items on the agenda are the election of three of the officers and the approval of changes to the by-laws that were suggested during the 1997 meeting.

BY-LAWS CHANGES TO BE VOTED AT THE ANNUAL BUSINESS MEETING

Prepared by A.M. Haeussler

Last year the membership of the Dental Anthropology Association voted to change the name of its publication from the *DENTAL ANTHROPOLOGY NEWSLETTER* to *DENTAL ANTHROPOLOGY*. Since the name of the publication appears in the by-laws of the association, the membership must approve the change of the name of the publication in those sections of the by-laws in which it appears. According to Article X, Section, 1: The By-Laws may be revised or amended at any meeting of the general membership by a two thirds vote of those present and eligible to vote, the proposed amendments or revisions having been mailed to the general membership thirty (30) days prior to date the vote is to be taken. The sections of the By-Laws that refer to the DAA publication are Article II: (c), Article IV:1(a), Article V:4.1, and Article IX:1(a).

The affected articles of the by-laws as they are at present are:

ARTICLE II: Objectives (c) To publish a newsletter, the Dental Anthropology Newsletter, the Official Publication of the Dental Anthropology Association (DAA).

ARTICLE IV: Board of Directors Section 1. The business of the Association shall be under the management of the Board of Directors, composed of the following elected officers: President, President-Elect, Secretary-Treasurer, Editor of the Newsletter, and one Executive Board Member.

ARTICLE V. Officers and Elections Section 1. Designation of officers (a) The elected officers of this organization shall be the President, President-Elect, Secretary-Treasurer, Editor of the Newsletter, and one Executive Board Member. The President, President-Elect, and Secretary-Treasurer shall serve for a period of two years, the Executive Board Member for a period of three years, and the Editor of the Newsletter for a period of four years.

ARTICLE VI: Duties of Officers Section 4. Editor of the Newsletter (a) Shall publish the Newsletter.

ARTICLE IX: Dues and Finance Section 1. Dues (a) To be included in the membership of the Association and receive a copy of the Dental Anthropology Newsletter (DAN), dues must be paid by January 31 of the current fiscal year.

The articles that the Executive Committee presents to the membership for its approval are:

ARTICLE II: Objectives (c) To publish the journal, *DENTAL ANTHROPOLOGY*, the Official Publication of the Dental Anthropology Association (DAA).

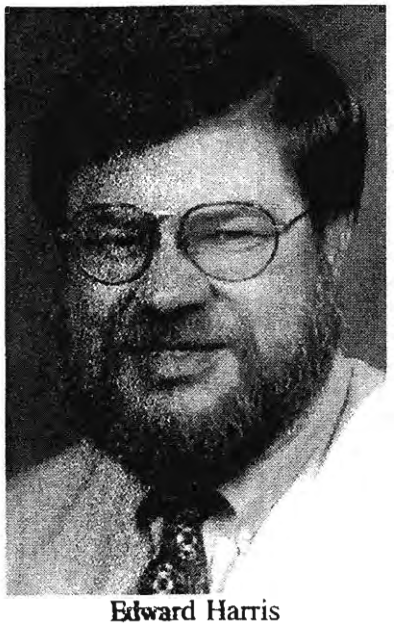
ARTICLE IV: Board of Directors Section 1. The business of the Association shall be under the management of the Board of Directors, composed of the following elected officers: President, President-Elect, Secretary-Treasurer, Editor of *DENTAL ANTHROPOLOGY*, and one Executive Board Member.

ARTICLE V. Officers and Elections Section 1. Designation of officers (a) The elected officers of this organization shall be the President, President-Elect, Secretary-Treasurer, Editor of *DENTAL ANTHROPOLOGY*, and one Executive Board Member. The President, President-Elect, and Secretary-Treasurer shall serve for a period of two years, the Executive Board Member for a period of three years, and the Editor of *DENTAL ANTHROPOLOGY* for a period of four years.

ARTICLE VI: Duties of Officers Section 4. Editor of *DENTAL ANTHROPOLOGY*
(a) Shall publish *DENTAL ANTHROPOLOGY*

ARTICLE IX: Dues and Finance Section 1. Dues (a) To be included in the membership of the Association and receive a copy of *DENTAL ANTHROPOLOGY*, dues must be paid by January 31 of the current fiscal year.

CANDIDATES FOR DENTAL ANTHROPOLOGY ASSOCIATION OFFICES

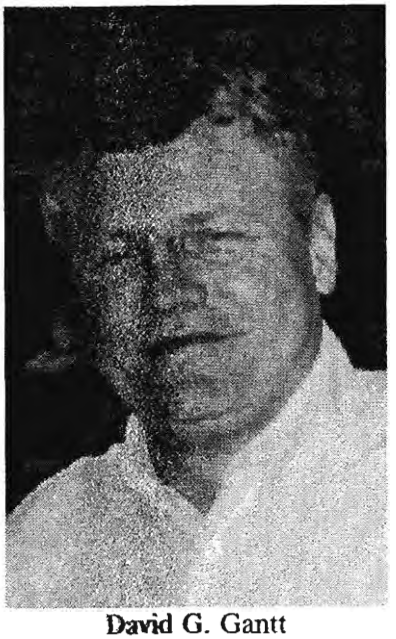


Edward Harris

Edward Harris candidate for president-elect

Harris, top right, received his Ph.D. in Anthropology at Arizona State University in 1977. He then completed an NIH-sponsored postdoctoral fellowship in craniofacial biology at the University of Connecticut Health Science Center (1977-1980). Since then Harris has been on the faculty of the College of Dentistry, University of Tennessee, Memphis. Harris is currently Professor of Orthodontics, Professor of Pediatric Dentistry, and Director of Research. His research interests include clinical dental trials, the biology of root resorption, odontometrics, etiology of malocclusion, and dental aging methods.

David G. Gantt, candidate for executive board member



David G. Gantt

Gantt, center right, is a founding member of the Dental Anthropology Association. He received a B.A. in anthropology and chemistry from the University of Washington in 1971. Gantt was awarded an M.A. and a Ph.D. in dental anthropology from the Washington University in 1976 and 1977 respectively after spending 1971 to 1973 at the University of Toronto studying dental anthropology. Since 1992 Gantt has served as Associate Professor in the Department of Biology and Adjunct Associate Professor of Anthropology, Georgia Southern University, Statesboro. Prior to 1992 Gantt has held positions as Associate Professor and Associate Professor of Orthodontics, Growth and Development and Oral Biology in the Emory School of Graduate Dentistry; Adjunct Associate Professor of Anthropology in the Department of Anthropology, Emory University; Assistant Professor of Dentistry in the University of Colorado Health Science Center and Adjunct Assistant Professor of Anthropology in the University of Colorado in Boulder; Instructor in the Department of Oral Biology in the School of Dentistry and Adjunct Professor of Anthropology in the University of Alabama in Birmingham; Instructor of Anthropology, University of Maryland's European Division, Germany and England; and Assistant Professor of Anthropology in Florida State University, Tallahassee and a member of the Graduate Faculty of the University of Florida.

Gantt's research interests are dental enamel thickness and structure. He has published over 75 technical articles, book chapters, reports, and abstracts on these topics. To accomplish his work Gantt has received ten awards and research grants from sources such as the National Institute for Dental Research, the Leakey Foundation and Georgia Southern University, Emory University, the University of Alabama, and Florida State University.

A. M. Haeussler, candidate for editor DENTAL ANTHROPOLOGY

A.M. Haeussler

Haeussler (bottom right) received a B.A. in microbiology from the University of Pennsylvania in 1954, and an M.A. and Ph.D. from Arizona State University in 1985 and 1996, respectively. Haeussler's research interests include the dental anthropology of Russia, Georgia, Ukraine, and the Central Asian republics, and Paleo-Indians. She is presently an adjunct professor of anthropology at Arizona State. She has served as editor of the *DENTAL ANTHROPOLOGY NEWSLETTER* and *DENTAL ANTHROPOLOGY* since 1991.

The Dual Congress: IV International Congress of the International Congress for the Study of Human Palaeontology and an International Meeting of the International Association of Human Biologists June 28 through July 4, 1998, South Africa

The International Congress for the Study of Human Palaeontology and the International Association of Human Biologists have combined to hold a Dial Congress in South Africa. The organizing committee of the human palaeontological portion of the Dual Congress has planned symposia, visits to some of the world's most famous Plio-Pleistocene sites, and exhibition of such renowned fossils as the remains from Taung, Sterkfontein, Swartkrans, and Mapakansgat, as well as to offer a taste of the varied cultures of South Africa. Phillip Tobias is president of the Dual Congress. Individuals interested in attending the Dual Congress may contact the Office of the Congress Organizer (Afrolympic Travel: 10 Bolton Road, Parkwood.P.O. 1263, Parklands, 2121, Johannesburg, South Africa, Telephone +27-11-880-2132, Fax +27-11-880-3161, Email afritrvl@global.co.za), the Department of Anatomical Sciences, University of the Witwatersrand, Medical School (7 Park Road, Parktown, Johannesburg 2193, South Africa (Telephone +27 11 647-2054/2516, Fax +27 11 643-4318, Email 055dc98@chiron.wits.ac.za) or consult the congress page on the World Wide Web (http://sunsite.wits.ac.za/conferen/dual98/home.html).

11th International Symposium on Dental Morphology August 26-30, 1998, Oulu, Finland Second Announcement

The response to the first announcement of the 11th International Symposium on Dental Morphology has been most encouraging. Already now almost two hundred people, active participants plus accompanying persons, have expressed their interest to take part in the symposium processes. Including a number of eminent seniors who have attended since the very beginning of the symposia.

The scientific program of the symposium is composed of the following sessions: Functional correlation between teeth and laws, Dental evolution, Dental genetics, Dental morphology, Morphological integration within the dental and craniofacial complex, Ontogeny and Technology. Also, other relevant topics are welcomed.

The reports are given in the form of oral or poster presentations. The scientific program includes also messages from key-note speakers, whose identities will be made public in due time.

For colleagues who are interested in attending but have not responded yet, please write to me at the address below.

The final announcement which includes also abstract and pre-registration forms will reach you mid-February 1998, and the planned deadline for the abstracts is March 15. If there is anything you wonder, please let us know. I am looking forward to seeing you in Oulu.

Lassi Alvesalo President of the 11th Symposium
University of Oulu, Institute of Dentistry, Aapistie 3, Oulu, 90220, Finland

Annual Meeting of the American Association of Physical Anthropologists March 31 to April 4, 1998, Salt Lake City, Utah, U.S.A. Selected Presentations

Papers and Posters by and/or of interest to DAA Members. Member-author names are italics. Location and precise time of presentations to be in upcoming issue of the *Journal of the American Association of Physical Anthropology*

Paleopathology I: The backbone of History and Disease in the Western Hemisphere. Symposium (April 2, 8:00 AM to 12:00)

J.C. Rose Health and nutrition in the western hemisphere: An introduction

R.H. Steckel, *J.C. Rose* , and *P. Sciulli* A health index from skeletal remains

R.L. Higgins, L. Walsh, M. Haines, and J.E. Sirianni: The biology of poverty: Skeletal and documentary evidence from the Monroe County Poorhouse

PAPERS OF INTEREST TO AND/OR BY DAA MEMBERS AT THE ANNUAL MEETINGS OF THE AAPA

C.S. Larsen, A.W. Crosby, M.C. Griffin, D.L. Hutchinson, C.B. Ruff, *M.F. Teaford*, K.F. Russell, M.J. Schoeninger, L.E. Serling, and S.W. Simpson: Biohistory, health, and behavior in the Georgia Bight

N.E. Tartarek and *PE Sciulli*: Temporal trends in health indicators among Ohio Native Americans

R. Thornton and P.L. Walker: Health, nutrition and demographic change in native California

D.J. Martin, A.L.W. Stodder, *A.H. Goodman*, and D. Reff: The American Southwest: Living on the edge of existence

Paleoanthropology I: Hominid Evolution — Early Hominids. Papers (April 2, 8:00 AM to 12:00)

G. Conroy, A. Kane, H. Seidler, G. Weber, and *P. Tobias*: ndocranial capacity of STW 505 ('Mr. Ples'), a new hominid cranium from Sterkfontein

B. Wood and M. Collard: Masticatory characters and estimates of primate phylogeny estimation.

C.A. Lockwood and *J. Moggi-Cecchi*: The systematic position of STW 183, an adolescent maxilla from Sterkfontein.

C.V. Ward, M.S. Drapeau, W.H. Kimbel, and *D.C. Johanson*: New postcranial fossils of Australopithecus afarensis from Hadar, Ethiopia.

Paleoanthropology I: Primate Evolution and General Paleoanthropology. Posters (April 2, 8:30 AM to 12:00)

E.C. Kirk and B.A. Williams: Dental evidence for cheirogaleid affinities

L.C. Bishop, T. King, and B. Wood: Comparative Study of East African Pliocene onmivore dental microwear.

C.M. Willermet and R.M. Quam: A fuzzy discriminant approach to assessing the taxonomic affinity of the Tabun 2 mandible: Neandertal or modern human

V.A. Villmoare: An analysis of craniofacial variation in *Homo erectus* from Africa and Asia using hominid analogs

Primate Biological Variation. Papers (April 2, 1:00 PM to 5:00 PM)

M. Spencer: Tooth root morphology and diet in primates.

A. Washburn: Polymorphic aspects of canine honing among Old World anthropoid males

A.B. Taylor: Masticatory form and function in gorillas

E.J. Smith: The diet of extant hominids as reflected by 2-D molar occlusal morphology

J.M. Plavcan: Craniofacial and body mass dimorphism in anthropoid primates

P.E. Reed, M.A. Grafton, *J.E. Phillips-Conroy*, C.J. Jolly: Differences in cortisol levels of anubis and hamadryas baboons captured in the Awash National Park, Ethiopia

Forensic Anthropology I: Papers (April 2, 1:00 PM to 2:30 PM)

M.Y. Işçan, S.R. Loth, and E.N. L'Abbe: Biocultural analysis of a forensic dental collection

R.F. Pastor: The recovery of skeletal remains of U.S. war casualties and the effect of cultural practices.

R.A. Halbertson, L.L. Taylor: Forensic photograph/live subject comparisons: Application of appropriate statistical tests

Forensic Anthropology II: Posters (April 2, 1:30 PM to 5:00 PM)

P.-F. Puech and I. Albertini: The reliability of composite portraits in forensic anthropology: The death mask of Napoleon Ist (1769-1821).

Human Biological Variation III: Papers (April 2, 3:00 PM to 4:45 PM)

M. Lampl, I.M. Bernstein, P. Jeanty, and D. Walrath: Fetal growth spurts: Fact and fiction regarding the fetal growth curve

Paleopathology II: Posters (April 2, 1:00 PM to 5:30 PM)

C. Rothschild, B.M. Rothschild, and *I. Hershkovitz*: Clues to recognition of kidney disease in archaeologic record

C.M. Greenwald, L. Jellema, *I. Hershkovits*, O. Dutour, and *B.M. Rothschild*: Anthropologic perspective of hyperostosis frontis interna

M.D. Hamilton and *M.K. Marks*: Oral pathology in a southeastern Mississippian period site

A.M. Lubensky, C.B. Ruff, and *M.F. Teaford*: Pathology in the Hampstead site; health in an early 19th century U.S. population

Paleopathology III: Papers (April 3, 8:00 AM to 11:45 AM)

P. Bennike, M.E. Lewis, H. Schukowtski, and F. Valentin: A comparison of childhood morbidity and mortality in two late Medieval cemeteries in Denmark

A. Cucina, A. Coppa, G. Gruppioni, and D. Mancinelli: Stress and mortality in pre-protohistoric samples from central-southern Italy: Linear enamel hypoplasia and demographic aspects

Skeletal Biology III: posters (April 3, 8:80 AM to 12:00)
G.L. Tasa: Craniometry of Pacific Coast Athapascans and population relationships along the North Pacific Coast
R.L. Koritzer and L.E. St. Hoyme: Dimensions of the pterygomaxillary hiatus: Afro-Euro-American variability
F. Kosa and A.K. Huxley: Comparability of lunar age calculated from Fazekas and Kosa's data on diaphyseal lengths to lunar age assigned to the fetal collections prior to curation at the National Museum of Natural History

Paleopathology IV: North American Treponematosis: A Natural History. Symposium (April 3, 2:00 to 6:00 PM)
P.L. Walker and P.M. Lambert: Prehistoric treponematosis in the western United States
C. Merbs: Discussant: North American Treponematosis: A Natural History

Paleoanthropology VB: Hominid Evolution. Papers (April 3, 4:00 to 5:45)
J. Calcagno:: Chair: Paleoanthropology: Hominid Evolution
R.M. Robinson and *L.C. Aiello*: A comparison of the temporal bone of aboriginal Australians with that of other modern human populations

Dental Anthropology I: Posters (April 3, 2:20 to 6:00 PM)
S. Hillson: Chair: Dental Anthropology I
J.D. Weets: Crossroads of the Pacific: A study of human dentition from Vanuatu
M. G. Muendel and *M.K. Marks*: Enamel microwear in a southeastern Mississippian sample
T.A. Tung: Analysis of dental non-metrics and demography to determine familial use of four Hellenistic-Early Roman (325 BC-AD 150) tombs in a rural inland site at Malloura, Cyprus.
N. Seguchi: Secular change of Japanese occlusion: The frequency of overbite and its association with food preparation techniques and eating habits
Y.K. Hallein: Sex-based differences in dental pathology rates in two Sudanese Nubian cemeteries
L. Cahue, N.J. Sauer, H.P. Pollard: Lip plug (bezote) abrasion facets in a Tarascan burial from Urichu, Michoacan
P.S. Ungar: Incisor microwear and anterior tooth use in three Native American populations
P.T. Daly and *J.E. Sirianni*: Incidence of alveolar bone loss in a nineteenth century, pre-industrial poorhouse cemetery
R. Sakashita, *N. Inoue*, T. Kamegai, and D.R. Hunt: Dental attrition and disease in several Pacific Island populations —Jomonese, Ainu, Maori and Aleut
C.M. Fitzgerald: Variation of dental microstructural growth markers in the enamel of three modern human populations
E. Harris: Tooth mineralization standards for the mandibular molar in American blacks and whites
H.K. Keene: Are we understanding canine sexual dimorphism in humans?
H. Wood, R.A. Foley, and M.M. Lahr: Cranial thickness and morphometrics
N. Tayles and G. Dias: Differential diagnosis of periapical cavities in alveolar bone

Human Biological Variation V: Biological Variation and Population Origins in the Americas and Australia. Symposium (March 4, 8:00 AM to 11:00 AM)
R.L. Hall: Organizer and Chair Human Biological Variation V
R.L. Hall: A 25-year update on T. Dale Stewart's Perspective on problems of early man common to America and Australia.
J.D. Irish, J.E. Lobdell, S.D. Davis. F.A. Solozano Barreta: Potential early prehistoric human remains from Jalisco, Mexico: A revised assessment.
J.F. Powell and W.A. Neves: Dental diversity of early New World populations: Taking a bite out of the tripartite model.

Primates VI: Primate Biological Variation: Posters (April 3, 8:30 AM to 12:00)
P. Lemelin and E.R. Dumont: Chewing rates and feeding styles in insectivorous primates and bats
D. Johnson: Exudate feeding and interspecific variability in postcanine size among Callitrichidae
A. Bellisari: Variation in emergence of deciduous dentition in a group of captive infant gorillas (*Gorilla gorilla*)
M.M. Stottlemire: Presence of dental enamel hypoplasia in wild-shot chimpanzees (genus *Pan*) and gorillas (genus *Gorilla*)

L.F. Zuccotti, M.D. Williamson, W.F. Limp, and P.S. Ungar: Modeling primate occlusal morphology in three dimensions using Geographic Resources Analysis Support System software
J. Harvati: Dental eruption sequence among colobine primates.
T.J. Masterson: Canine form in *Cebus*
P.W. Lucas, *M.F. Teaford*, P.S. Ungar, and K.E. Glander: Physical properties of foods in *Alouatta palliata*
F.P. Cuozzo: Craniodental indicators of body weight in *Galagoides demidovii* and *Tarsius bancanus*
J.C. Bicca-Marques: Heterochrony and size reduction in the dentition and hands of Callitrichinae

Dental Anthropology II: Papers (April 3, 1:00 to 5:00 PM)

J.D. Irish: Chair of Dental Anthropology II

A.M. Haeussler: Ukrainian Neolithic cemeteries: Dental anthropological analysis of twelve sites

W.-R. Teegen and M. Schultz: Teeth as tools in the Late PPNB population from Nevali Cori (Turkey)

A. Coppa, A. Cucina, R. *Vargiu*, G.C. Cosseddu, G. Flores, R. Flores, and M. Lucci: Dental anthropology of prehistoric Sardinians (V-I millennium B.C.): Oral pathologies. metric and non-metric traits.

A.T. Mayes :Genetic markers as indicators of familial relationships at Spiro Mounds, Oklahoma

S.A. Al-Abbas: Neolithic collapse in the Levant viewed from dental enamel hypoplasia

S.E. Bailey, C.G. Turner II, and *P.H. Du Souich*: Dental morphological evidence for population affinities of the Iberian Peninsula (100 BC-1300 AD) and the Western Balearic Islands

A.F. Christensen: Colonization and microevolution in the Rio Verde Valley, Oxaca, Mexico

S.E. Burnett, J.D. Irish, and M.R. Fong: How much is too much? Examining the effect of dental wear on studies of dental morphology

M.M. Glantz: A reassessment of the relationship between dental wear and subsistence in the Levant

S.W. Hillson: The anthropology of antemortem tooth loss

M.L. Mifsaud and *M.K. Marks*: Enamel microdefects in a modern sample

L.W. Konigsberg, D.L. Holman, and R.E. Jones: Multivariate probit analysis of the deciduous dental emergence

M. Yuan, R. Holloway, *L. Moss-Salentijn*, M. Yoder, and D. Broadfield: Perikymata counts in two modern human sample populations.

D. Guarelli-Steinberg: Linear enamel hypoplasia and life history in Cayo Santiago rhesus monkeys

M.S. WIllis and *D.R. Swindler*: The lower third molar and the hypoconulid in Asian colobines

Paleoanthropology VII: Primate Evolution. Papers (April 3, 1:00 PM to 5:00 PM)

E.R. Miller, G.F. Gunnell, and E.L. Simons: Origin of Arthropoidea: Dental evidence and the recognition of earliest anthropoids in the fossil record

M.J. Ravosa and S.A. Islam: The evolution of anthropoid jaw loading and kinematic patterns

B.R. Benfit, S.N. Gitau, M.L. McCrossin, and A.K. Palmer: A mandible of *Mabokopithecus clarki* sheds new light on oreopithecid evolution

A.K. Palmer, B.R. Palmer, B.R. Benfit, M.L. McCrossin, and S.N. Gitau: Paleoecological implications of dental microwear analysis for the middle Miocene primate fauna from Maboko island, Kenya

D.G. Gantt and J.A. Rafter: *Pro-consul* —Thick or thin? A study of enamel thickness and its significance

T.C. King: Dental microwear in *Griphopithecis alpani*

K.E. Juell, S.C. Josephson, and J. Kelly: Sexual dimorphisms and species composition of the Lufeng dental samples

Skeletal Biology V. Papers (April 3, 1:00 PM to 5:00 PM)

P.D. Tomczak, C.M. Malcom, and *J.E. Buikstra*: Variation between and within three Chiribaya populations: Anthropometric and dietary evidence

A. Alvrus: Fertility and subadult mortality in Semna South, Sudanese Mubia

B.E. Hemphill: An initial craniometric examination of the origins and inter-regional impacts of the Oxus civilization populations from the North Bactrian Oasis of central Asia.

GUIDELINES FOR CONTRIBUTORS TO *DENTAL ANTHROPOLOGY*

DENTAL ANTHROPOLOGY uses the following guidelines.

1. Articles have short abstracts. Text format, citation, and abbreviation styles follow those used by *American Journal of Physical Anthropology*. However, names of journals that are not familiar to readers are spelled out. The feature, *Recent Publications*, contains unabbreviated citations.
2. Illustrations and photographs enhance articles and are encouraged. They will be returned, if the authors so request. Graphs should be accompanied by a table containing the data, even if the table is not to be published. In that way, the editor can construct a new graph if the one submitted presents problems in formatting.
3. Two copies of each manuscript should be submitted: the first for the editor, the second for review by a member of the editoril board. The second copies of illustrations can be photocopies. Contributors are also asked to send a copy of the manuscript on diskette, if possible The newsletter uses IBM© format and *Word Perfect* 6.1©.
4. Deadlines for manuscripts and membership lists for the next issues are July 15 and November 15, 1998. Manuscripts and membership lists received after these dates will be considered for future issues.

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