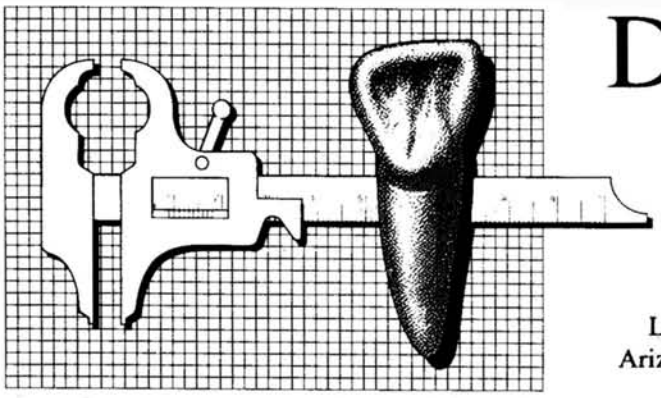

Dental Anthropology Newsletter

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Presidential Address

Stephen Molnar

I have just returned from Denver and the annual AAPA meetings where we held our business meeting of the Dental Anthropology Association. I am pleased to report that several positions were filled. John Lukacs of the University of Oregon was elected as president of the association for a two year term. Our able secretary treasurer, Joel Irish, will continue and finish out his term of office this coming year. Likewise, Linda Winkler will continue as executive board member for one more year. This continuity of key officers will aid in the transition to a new president. I can say that these two people have been very helpful to this out-going president and I am certain that John will find their assistance as invaluable as I. Of special importance and interest to all members is that Sue Haeussler agreed to stand as a candidate for editor and was elected unanimously to serve another four year term. Deep appreciation was expressed by all and congratulations to Sue for a job well done.

A main order of business was the amendments to our by-laws describing the designation of officers, the composition of the board of directors, and a description of their duties. The key amendment was the establishment of the office of president-elect who shall serve on the board, assist the president, and fill in for the president in the event the president is not able to perform his or her duties. All amendments were passed and I am happy to report that Phil Walker of the University of California, Santa Barbara, was elected to the office of president elect. He will assume the office of president two years hence. In the meantime he will assist John Lukacs, and I suspect they already are formulating some major plans for future developments.

One proposal that is most likely to be considered soon is the DAA's participation in more symposia at the AAPA meetings. Considerable interest and discussion on this topic was expressed from the floor. One suggestion was that we should sponsor both paper and poster presentations and that the DAA president should be the organizer. The members present unanimously agreement that the association will arrange a symposium in honor of Dr. Albert Dahlberg for the next meeting. Since many of us became interested in dental anthropology through his works and certainly all of us were influenced by his writings, it is fitting that this association make every effort to present a Dahlberg symposium — perhaps a full day (I am sure we could fill one easily) and a poster session, too. Let us have your ideas and suggestions. Volunteers, of course, are needed. Direct your responses to the new president. This retiring president is off to Adelaide, Australia for a bit of relaxation (some research, too).

Another point I wish to raise is the growth of the association. The secretary-treasurer's report will provide details on memberships, expenses, dues, etc., but I would like to comment that our mutual interest in orofacial biology encompasses a broad area. The Dental Anthropology Association includes people from a number of disciplines and is a meeting ground for members of several professions. I believe we should continue to expand and to include the several that are now under represented: primatologists, anatomists, taxonomists, and geneticists, as examples. Let us tell our colleagues about the possibilities and the advantages of an exchange of ideas in our newsletter, a publication that grows in size every issue. In addition, let us participate more ourselves and increase the interchange across disciplinary boundaries. There was also a strong feeling expressed at the business meeting that we sponsor the membership of more of our colleagues in other countries.

Finally, I wish to thank Linda Winkler and Joel Irish for their help and guidance and especially Sue Haeussler for her able editorship. They all made my tenure as president a pleasant experience.

Etruscan Gold Dental Appliances: Origins and Functions as Indicated by an Example from Orvieto, Italy, in the Danish National Museum

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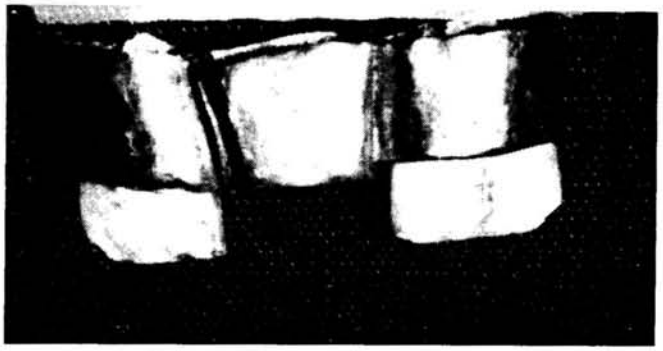

Fig. 1. Copenhagen Bridge (Etruscan), labial aspect. Gold appliance holding (left and right) maxillary right lateral and left central incisor crowns. Photo courtesy editors Danish Dental Journal.

ABSTRACT The ancient Etruscans invented the dental bridge over 2,500 years ago. The earliest known example, made from pure gold, was excavated from the ancient site of Satricum in central Italy. It has been dated to ca. 630 BC. At that time this village was within the Etruscan realm. All of the earliest examples of these dental prostheses derive from Etruscan contexts. Study of all of the known dental appliances from this part of the ancient world suggests that their use faded as central Italy came under Roman influence.

Among the 19 known prostheses from Etruscan archaeological contexts (Becker, nda) is an outstanding example, believed to be from Orvieto, now in the Danish National Museum in Copenhagen (Figs. 1, 2) (Becker, 1992). A detailed description of the Copenhagen example allows it to be compared with other known pieces. We now have a clear understanding of the various ways in which prostheses were made and used.

A significant discovery is that these Etruscan bridges were worn only by females, suggesting that cosmetics and vanity were important dental concerns. The unusual construction technique of the Copenhagen piece and its place within the typology of examples reflects the evolution of this technology over more than 400 years.

INTRODUCTION

Many scholars have reviewed the outstanding nature of Etruscan goldsmithing skills (De Puma, 1987). However, Etruscan primacy in applying related technology to prehistoric dentistry is less well known than their abilities to fashion complex jewelry and vessels from precious metals. Despite the abundant evidence, many scholars deny that the Etruscans made the first dental appliances and believe that such technology had its origins in ancient Egypt. Over 2,600 years ago Etruscan goldsmiths were the first to fashion complex dental appliances which had therapeutic as well as cosmetic value. This review, the first in a series of brief articles, offers the results of eight years of research relating to ancient prostheses, copies of prostheses, and various items mistakenly believed to be ancient dental appliances.

An extensive literature discussing ancient dental prostheses has emerged since 1885. These appliances are known from ancient literary sources, which were written at the time that these dental bridges were in use. Archaeological evidence confirming these classical texts emerged in the late 18th century (Böttiger, 1797:63).

Results of recent excavations demonstrate that the earliest examples date from the 7th century BC. A score of ancient dental appliances, in an amazing variety of shapes and sizes, are now known throughout the eastern Mediterranean from Italy to Syria (Becker, nda). Since Deneffe's (1899) early inventory, a considerable number of lists have emerged (Sudhoff, 1926; Casotti, 1947), and Tabanelli (1963) has attempted a true catalogue. Dental as well as other ancient prosthetic devices were reviewed by Bliquez (1983), who gathered specific information regarding various dental prostheses and their history (Bliquez, in press). The Bliquez inventory includes many of the best available photographs of these items (see also Emptoz, 1987).

Archaeological data for most of the known prostheses, however, are surprisingly limited. Also, as Waarsenburg (1990, 1991) notes, modern descriptions of the prostheses themselves generally are so poor as to create numerous errors in the literature. These various difficulties can be remedied only by detailed studies of each of the appliances, such as Clawson's (1934) outstanding contribution, and careful studies of the dental and skeletal materials found in association with these prostheses. Also important in understanding the contexts within which these appliances were made and used is the literary evidence (Becker, nda) of the relationship of practitioners of medicine to those who performed dental extractions. The manufacture of dental appliances was a skilled activity, which was the work of goldsmiths and other crafters, rather than the work of barbers or physicians.

ORIGINS OF DENTAL PROSTHESES

The earliest records of dental care can be found in Egyptian medical papyri of the 17th and 16th centuries BC (Badre, 1986). These texts relate only to medical treatments and include no references to dental prostheses. Clearly these texts predate the Hippocratic corpus, and are basic to understanding the early history of dental medicine. The treatment of oral disease, however, long precedes the development of dental appliances, which first emerge in the Etruscan world in the 7th century BC (Bliquez in press, citing Hoffmann-Axthelm, 1985:28-31,38-39).

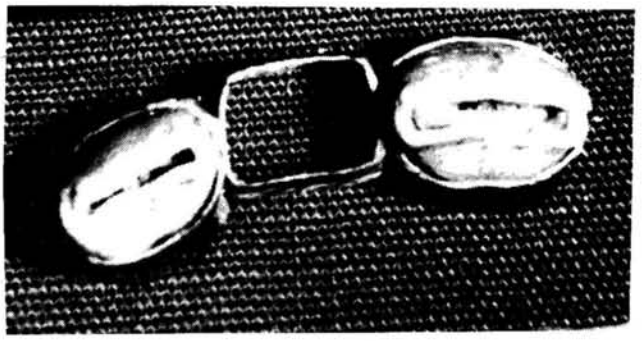

Fig. 2. The Copenhagen Bridge (Etruscan), occlusal aspect. Appliance encircling (from left to right) right lateral incisor, space for replacement right central incisor, and left central incisor. Photo courtesy editors Danish Dental Journal.

No example of a Sumerian or Egyptian dental prosthesis from before the 5th century BC can be verified (Masali and Peluso, 1985; Corruccini and Pacciani, 1989:61). Guerini (1909:28) suggested that the Egyptians may have decorated teeth with gold after death, but also concluded that they produced no dental prostheses. Emptoz (1987:546, fig. 1) noted that in 1914 Junker found what were called "wired teeth" in a tomb at Gizeh dating from 2,500 BC, but indicated that these "teeth" were actually an amulet (Becker, nda). The supposed primacy of Egyptian or Phoenician dental appliances (Lufkin, 1948; Woodforde, 1968) is nowhere supported by direct evidence. Clawson (1934:23-24) put it best when he stated that "contrary to the beliefs of various writers," whom he cites, "detached archaeological specimens of Egyptian prosthetic dentistry do not seem to exist."

The precise origins of gold dental appliances certainly predate the 6th century BC. By 630 BC (Becker, nda) a high status resident of ancient Satricum was buried wearing a complex and sophisticated dental appliance, suggesting that skills in the production of dental prostheses probably extend at least back to the middle of the 7th century BC. Over the next few hundred years the general availability of such gold prosthetic devices in Etruria, and to the south in Rome, is indicated clearly by the numbers of examples which survive, as well as the frequency of reference to them in the ancient literature and from the Law of the 12 Tables (a code of general laws, probably collected in Rome about 450 BC, and maintained in force for many centuries).

The Etruscans were the first to develop true dental bridges, in that these devices were anchored to sound teeth and usually provided the means for replacing as many as four missing teeth. My work has shown that all the wearers for whom gender can be determined were female. Thus, the use of these appliances may have been primarily cosmetic. The demise of technology in dental appliances paralleled the demise of Etruscan society, which was unusual in that women there enjoyed high status.

Quite interesting, however, is the fact that no examples of gold bridgework appear to survive from the period of the later Roman Republic or of the Empire, although literary references appear to attest to their presence (Bliquez, in press). Bliquez rightly dismissed Guerini's (1909:100) suggestion that by the Late Republic full sets of removable dentures were being produced. Even if this were the case, a demand for bridges would have continued and later examples should be known. Perhaps late examples of prostheses had been removed before burial or looted from graves. Another possibility is that they have been poorly documented when recovered. This last scenario would have led to their inclusion in the corpus without appropriate archaeological documentation which would have allowed us to assign a correct date. However, the possibility that these appliances faded with the Etruscans by the 1st century A.D. is offered here.

FUNCTIONS

While most of the known ancient dental prostheses from Italy appear to be cosmetic, at least some simple bands may have served to stabilize loose teeth. These may have been teeth loosened by a blow. However, the Etruscan and related examples more likely served to prevent (or retard) the loss of teeth loosened by periodontal disease. Some of the few prostheses known from the Phoenician world clearly were purely functional. Simple gold bands (and in the east, gold wires) were used in constructing these functional appliances. However, the decorative aspects of the Etruscan types cannot be ignored.

Both cosmetic and functional dental appliances are mentioned in the ancient texts (Becker, nda). Even those cosmetic appliances which appear to have been designed only to fill the gaps left by lost teeth also

would have served to maintain the remaining teeth in their correct places, thereby assuring continued proper articulation of the teeth and their continued efficient function. The individual's own teeth, presumably loosened by periodontal problems and removed by a specialist (cf. Ginge et al., 1989), would have been used in the appliance (Guerini, 1909:71-73, 79; Deneffe 1899:78; Casotti 1947:669). Such recycling of one's own teeth might also have guaranteed correct color and size match. The recent suggestion (Capasso and Di Tota, 1993) that one of these appliances may have been used deliberately to effect a "shifting of teeth" is easily dismissed by anyone familiar with goals, functions, and processes of orthodonture.[1]

As Martial (1897) records, various substitutes for human teeth, such as bone or ivory, and even the tooth of an ox, were commonly employed in ancient Italy. Pine and boxwood, such as that used for the dentures of President George Washington, are said to have been used by the Romans (Bliquez, in press). This all leads to the question of the identity of the makers of these prosthetic devices. Bliquez and others (Guerini, 1909:102; Hoffman-Axthelm, 1985:30) must be correct in concluding that goldsmiths, ivory carvers, and other artisans fabricated these appliances. The makers also probably fitted or applied these devices as a branch of cosmetology with therapeutic value, independent of dentists who did extractions, or of physicians who prescribed for diseases of the mouth.

THE COPENHAGEN BRIDGE (Inv. no. 8319) AND ITS CONSTRUCTION

The present location of this example is the National Museum, Copenhagen (Department of Near Eastern and Classical Antiquities). This piece remains almost unknown, although at least five authors have noted it in the literature (Bliquez, in press; Johnstone, 1932a:132, Pl. 94:17-18; 1932b; Marvitz, 1982:49; Pot, 1985:38-39; Poulsen, 1927:47). Riis (1941:161) believes that it came from Orvieto.

The appliance was made from three small, separate gold loops which had been cold welded together (Figs. 1, 2). The bridge looped the upper left central incisor, encompassed a replacement for the right central incisor, and was secured on the other end to the right lateral incisor. The associated teeth indicate that the appliance was meant to be worn by an adult female (Becker, 1992; nda).

The Copenhagen prosthesis demonstrates the use of a complex variation of the simple band technique, which is only one of at least four variations which are known (Becker, nda). The Copenhagen bridge was made of three separate rings. The bands had been created to surround either an anchor tooth or the false tooth, which is now missing (Anchor or post teeth were sound or living teeth to which the bridge was attached to hold it in place). All three bands, including the gold band or collar for the replacement tooth, were joined at their adjacent surfaces by invisible cold welds (Becker, nda). Each was custom designed to fit one element. The lateral loops were curved in such a way as to conform to the base of each existing crown (the left central and right lateral incisors), with specific fitting done after the false tooth had been set in place and the appliance was ready to be inserted.

While the lateral loops were designed to surround the curves of the natural teeth, the central band, made to hold the artificial right central incisor, had been bent into a sharply rectangular form to prevent the replacement tooth (of ivory or bone) from slipping in this collar. The replacement tooth set into this "box" would have been a "crown" only, with the upper and exposed portion carved to mimic the tooth which it replaced. The lower part or base of the false tooth would have been square-cut to fit into the "box" where the angular shape would prevent it from slipping in its gold collar.

A small band was made and then fitted with the replacement tooth the way a goldsmith would make a bezel setting. The rectangular setting would prevent rotation and facilitate a good fit. Then the replacement tooth would be secured in place by pressing the gold tightly, as had been done with the gold of the lateral loops. The result was the bridge, of a design remarkably similar to modern examples. Finally, the lateral bands were fitted to the living teeth, by simply pressing the soft (extremely pure) gold bands securely around them. The appliance was meant to be a permanent fixture. Interestingly, no rivet had used to fasten the single replacement tooth in this appliance, as was common in other types of Etruscan gold dental appliances, since the false tooth had been held in place the way a gemstone is fixed in its setting.

The thickness of the three gold bands varies, and this feature is exaggerated by the bending and fitting which probably made this appliance more effective than bridges which incorporate only a single long band. Although measurements were difficult to secure, due to the presence of teeth within the appliance and modern glue on many surfaces, fairly accurate readings could be secured at a number of locations. The left element, surrounding the left central incisor, is a band beaten or worked to a thickness of about 0.3 to 0.4 mm. The thickness around the central element, which would have held the replacement right central incisor, is close to 0.3 mm, and that around the right lateral incisor is under 0.3 mm, possibly as thin as 0.2 mm.

These variations in thickness suggest a gradual thinning of these bands. Perhaps, a single long strip was the source of all three units, and this source was thicker at one end than the other. While this may have been the case, the measurements may reflect random variation, slight bends or disturbances which occurred after death, and even thinning which was part of the fitting process. Quite clearly, the only point of considerable importance is that the thickness of the gold band appears to fall between 0.2 and 0.4 mm.

The breadth of the gold band forming each unit also shows minor variations. These breadths are indicated at various points along each unit by an arrow pointing to the band opposite a "tick" at the opposite side of the band, with the measurement placed at the end of the arrow (Figs. 3, 4, 5). The center of the labial surface of the left unit measures 5.8 mm high (not shown). An encrustation of glue obscures configuration of the rear surface. The height of the band forming the central unit is 6.1 mm along the labial surface where it attaches to the left unit (not shown). This strip broadens toward the midline of the labial surface where it is approximately 6.5 mm mesio-distally (not shown). The right unit is formed from a band which is a bit under 6.0 mm high at the lingual-distal corner, but widens to 6.1 mm and continues to increase in height toward the front of the tooth where it reaches 6.3 mm high at the labial-mesial corner (Fig. 3). As noted above, these variations may be due to changes effected in the gold band during close fitting rather than from variations in the shape of the gold strip or strips from which the appliance was formed.

The shape of each unit clearly reflects the tooth or tooth substitute which was meant to be enclosed (Figs. 2, 3, 5). The left unit is relatively oval in plan at the lower margin, but nearly square at the top where it surrounded the widest aspect of the tooth. The central unit is nearly a perfect rectangle in plan both at its top and at its bottom, with the lower aspect being slightly smaller than the upper (Becker, 1994). The right side unit is a very irregular square at the upper side and an irregular oval at the lower edge.

The nature of the false tooth that was firmly fixed into the central socket of this appliance is unknown. It probably had been fashioned from ivory or an animal tooth, or even from bone. Since the upper diameters of the surrounding gold band are larger than the lower, there was no danger that the tooth could drop out, and a firm set against the gum (or even a tooth stump) would have prevented the tooth from working its way upwards and out of the yoke. The probability is that the gum would recede away from this "tooth" and that a new element would have to be fitted from time to time. This could be done with relative ease, or at least as easily as the removal of the entire device from the adjacent teeth.

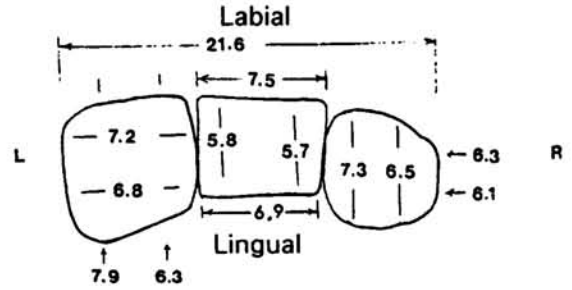

Fig. 3. The Copenhagen Bridge (8318) (Etruscan). Line drawing showing dimensions (in mm) of the occlusal (inferior) aspect. Left to right: left central incisor, bridge for the replacement right central incisor, and right lateral incisor.

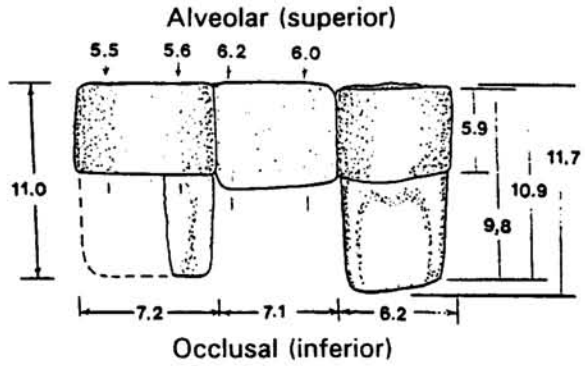

Fig. 4. The Copenhagen Bridge (8318) (Etruscan). Lingual surface of appliance with teeth in place. Drawn in 1987 showing damage to left central incisor which postdates photographs in photographs in Figs. 1 & 2. Left to right: left central incisor, bridge for replacement right central incisor, right lateral incisor. Dimensions in mm.

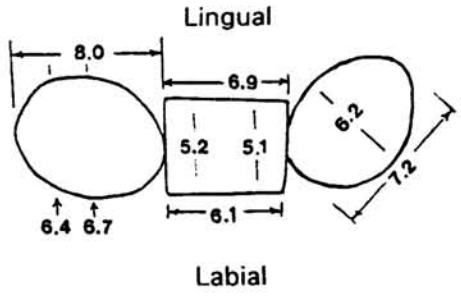

Fig. 5. The Copenhagen Bridge (8318) (Etruscan). Line drawing showing dimensions (in mm) of the alveolar (superior) aspect. From left to right: left central incisor, bridge for replacement right central incisor, and right lateral incisor.

THE ANCHOR TEETH OF THE COPENHAGEN BRIDGE

Photographs of this bridge depict the intact crowns of the anchor teeth (left central and right lateral incisors) within the lateral loops of the bridge (Figs. 1, 2; see also Marvitz, 1982:49). When examined in 1989, the left central incisor, when viewed from the lingual aspect, was badly fractured (Fig 4), and what appeared to be transparent glue covered much of the lingual surface of the teeth and gold piece. The damage and glue may be the result of the display of this item about 1982.

The crowns of the flanking anchor teeth survive, but the artificial insert for the right central incisor is absent, probably having deteriorated post mortem. Processes of decay may have dissolved the roots of the anchor teeth, as well as most of the dentine within the crowns (Fig. 2). The left central incisor still has much of its neck area preserved within the area of the gold band despite damage to the crown, which is largely missing except for the labial-mesial aspect of the enamel.

Both extant teeth appear to have been worn along the occlusal or cutting edges just into the dentine, but there is no trace of secondary replacement in the dentine area. There is, however, general loss of dentine due to post-mortem decomposition (Fig. 2). The entire crown of the right lateral incisor is intact and shows very little recent damage. Some tiny chips along the occlusal surface reflect continued biting of hard materials or coarse elements (Fig. 1). A trace of shoveling (1 on a 0-4 scale) is evident. Shovelling also appears along the mesial margin of the left central incisor, and is seen as a trace on the distal margin (not visible in the figures).

Maximum diameters cannot be measured directly, but may be estimated from the dimensions of the enclosing goldwork. The left central incisor can be estimated to have been 7.8 mm mesio-distally (not shown), the right central incisor about 7.5 mm mesio-distally (Fig. 3), and the right lateral incisor only 6.9 mm mesio-distally, although the band enclosing it has an inferior diameter of 7.2 mm (Fig. 5). In height the left central incisor is estimated at 11.5 mm, which is greater than the 11.0 mm which remains, as indicated in Figure 4. The left central incisor appears to be approximately 10.9 mm high (Fig. 4).

The small size of these teeth and the gap which was bridged by this appliance suggest that the wearer of this bridgework was a female. Although age determination by degree of wear requires a comparative population of some numbers and is less effectively applied to anterior teeth, the individual represented by these teeth appears to have been over 30 years of age, but probably under age 50.

The catalogue card for the Copenhagen appliance states that it was a gift from the Ny Carlsberg Foundation in 1924. The National Museum has an excellent photograph (Neg. No. M 194; FOI 132). The attribution of this appliance to Orvieto derives from Riis (1941:161), and is discussed extensively by Becker (in press). Most of the vessels noted by Riis, only some of which may have been in the same tomb as the dental appliance, suggest a date of approximately 500-490 BC.

DISCUSSION AND CONCLUSIONS

Just over 100 years ago, Lanciani (1892:353) noted that the tombstone of an ancient Roman dentist named Victorinus depicted an instrument of his trade, a pair of dental forceps. Other medical practitioners in Rome, of both Greek and Roman origin, also had similar tools shown on their funerary monuments (Lanciani, 1892; Jackson, 1988:119). The numerous medical kits known from antiquity, however, do not include the specialized tools which are needed by the goldsmith. Nor do we find any literary evidence which might suggest that gold dental appliances were fashioned by any of the people more directly involved in the medical arts (Becker, nda).

Quite clearly the three elements of the Copenhagen bridge, as is the case of other appliances using a series of welded rings, were extremely carefully fitted to the teeth that they surround as well as to each other. This skilled application may have provided a much better fit and, therefore, greater stability than is achieved through the use of a single long band. However, this apparent improvement need not reflect chronological aspects of ancient dentistry. The use of a more successful method of fitting a dental appliance may reflect only the great concern of this "dentist," or greater skills of a goldsmith who was fashioning the bridge. Although both skills may have been employed by the goldsmiths making long band bridges, this may not be the case with this appliance. Both sets of skills (knowledge of teeth involving the fitting of gold to them and knowledge of goldsmithing) are quite highly developed in the Copenhagen example. That these may also have been the skills of a single individual would suggest that such a person was an extremely talented crafter.

If the Copenhagen bridge represents an evolved form of dental appliance within the ancient world, then we can see a stage, from which the next logical step would be the formation of a solid gold tooth which might have mastication among its functional aspects. The greater expense of a solid gold appliance, as

compared with ivory or natural teeth, may have retarded its development, but we can see that the attachment of gold loops to a solid tooth certainly was within the technological capabilities of these ancient dentists.

The earliest dental appliance, the Satricum band with a gold tooth attached (ca. 630 BC), is the only one known to use a gold tooth (Waarsenburg, nd; Becker, 1994, in press). Since we have no evidence to indicate that this technique was ever repeated, we may conclude that it was soon discontinued. This observation suggests that soon after, or perhaps by 600 BC, the use of false teeth, human or carved to look like natural teeth, had become the fashion. This appears to relate to the finding that where a specific evaluation of gender has been made, the Italian wearers of these gold bands all appear to have been women.

Johnstone (1932b:448) indicates that the Etruscans were the first to construct true dental bridges, and all subsequent research supports this hypothesis. The tentative sequence for these dental appliances suggests a gradual development in the techniques of applying dental bridges (Becker, ndb). Various examples suggest that a few talented individuals may have carried their craft to unusual heights, but those achievements were not continued after the decline of ancient Rome and had to be re-invented by modern practitioners.

ACKNOWLEDGEMENTS

Sincere thanks are due Prof. L. Bliquez for sharing important information relating to this subject, and to Søren Dietz, Keeper of the Department of Near Eastern and Classical Antiquities (National Museum, Copenhagen), for permission to publish this important piece. Thanks also are due Dr. Helle Salskov Roberts and Prof. Pia Guldager Bilde for aid in various aspects of this research. The kind co-operation of the entire staff of the National Museum of Denmark is gratefully acknowledged. Preliminary arrangements to conduct this study were made while the author was in Copenhagen conducting research sponsored by the American Philosophical Society (1987). The support of Mag. B. Højby Nielsen in this research is most gratefully acknowledged. Any errors of interpretation or presentation, of course, are the responsibility of the author alone.

[1]The digression in the note by Capasso and Di Tota (1993:6-7) into the subject of the gold dental appliance from Pieve offers a brief commentary on an artifact for which we had no detailed description (Corruccini and Pacciani, 1989) and no documentation of any archaeological context. This has now been corrected. In Bliquez's (in press) work, as well as in my own survey of these pieces involving direct examination and commentary on each known example plus tracking copies and "pieces" which have been fabricated in the literature, considerable numbers of errors have been discovered which resulted simply from the erroneous printing of negatives. While the greatest number of errors derive from the lack of direct examination of these appliances on the part of authors and other sources of error, note will be made here only of the ways in which published prints contribute to this problem.

Readers' attention should be directed to Capasso's photograph (1986:54) of the Firenze piece said to have been excavated at Poggio Gaiella in Citta' della Pieve, which is 7 km south of Chiusi and 43 km southwest of Perugia. Capasso's figure derives from the same negative as that used by Corruccini and Pacciani (1989: fig. 2), but one of the two is printed in reverse. Further note should be made of the drawings used by Capasso and Di Tota (1993: figs. 2, 3), which are exactly those used by Capasso (1986:55) in his popular piece, except that one is the reverse of the other. Capasso and Di Tota (1993) also assume that the mandibular lateral or central incisor of the Poggio Gaiella appliance was lost ante-mortem and that the lower left canine is missing. This is not the case, as demonstrated by colored plates in Laviosa, et al. (1993:131,figs.V4,V5). Corruccini and Pacciani's (1989:62, fig.1) age evaluation (16 years) is far too low since several features indicate that the age at death was greater than 25 years. Inferences that the break in this appliance occurred during the recent flood in Florence, like the idea that these appliances could be used to close gaps in the dental arcade, are not correct.

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Oral Condition of Three Yanomama Indian Tribes of South America

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ABSTRACT The permanent dentition and supporting tissue of 140 Yanomama Indians ranging in age from three to more than 40 years was examined for malocclusion, caries, attrition, and periodontal disease. Their oral status is characterized by malocclusion (79%), anterior tooth crowding (55%), a low frequency of caries (14%), periodontal disease (83%), and a linear progression of occlusal attrition with age. The Yanomama are recognized as having been geographically, genetically, and linguistically isolated for a minimum of 500 years. This situation permits the use of their dental condition to assess the hypotheses that admixture and/or tooth use is chiefly responsible for the widespread malocclusion found in many modern Yanomama populations. Because the Yanomama have seemingly not been affected by foreign admixture, and because they possess marked tooth wear evidencing heavy mastication, neither admixture nor lack of masticatory function can be responsible for a high degree of malocclusion.

INTRODUCTION

The dentition and jaws of many contemporary populations are characterized by high incidence of static and dynamic malocclusion, ranging in frequency from 22.4% to 91.4% (Hrdlička, 1935; Mills, 1963; Horowitz, 1970). Although malocclusion is rarely found in early hominid and prehominid fossils (Pereira, 1972), it has been observed in the form of tooth crowding in some australopithecine material (Oppenheimer, 1967). Still, high frequencies of malocclusion are apparently a relatively recent development in some groups of *Homo sapiens*.

Precise causes for changes in the human masticatory system have not been established, but several hypotheses exist for the reduction in jaw and tooth size. Some of the notable hypotheses are: (1) a reduced need for heavy chewing (Benjamin, 1962; Dahlberg, 1963; Mahler, 1967); (2) the advent of tools as substitutes for teeth (Brace, 1964; Brace and Montague, 1965); and (3) possession of some adaptation that reflects selective pressures on a whole functional matrix which involves the teeth and jaws (Bailit and Friedlander, 1966). Another factor that may have contributed to increase in malocclusion, other than the three factors outlined above, is admixture resulting in large teeth in small jaws (Mills, 1963).

Therefore, the primary purpose of this paper is to examine the hypotheses concerning dental crowding in a living population which possesses two necessary conditions: (1) low to absent admixture and (2) a hunter-

gatherer type of diet and method of food preparation. The Yanomama Indians living in the Federal Territory of Roraima, South America, were selected, even though they might be classed as tropical forest village farmers in Steward's (1959) sense. The Yanomama have maintained genetic integrity for roughly 500 years.

MATERIALS AND METHODS

Three of the Yanomama Indians were the subjects of this study: (1) Surucucu (n=48) who are mountain dwellers and subsist mainly on small birds and bananas, (2) Tototobi (n=48), and (3) Catrimani (n=52). The Tototobi and Catrimani live in river valleys where game animals are plentiful and meat is the staple food. Thus, the tribes can be divided into two nutritionally similar groups: the Surucucu (higher carbohydrate) and Tototobi and Catrimani (lower carbohydrate).

The dentition and jaws of the 148 Yanomama Indians (divided into the two generalized nutritional groups) were examine by one of us (C.B.P.) for malocclusion, caries, attrition, and periodontal disease. Occlusal attrition was scored with Pedersen's (1955) Index of Attrition. Malocclusion was scored with the Canadian Index (Rubierto, 1958) and caries and periodontal disease assessed with Ramfjord's (1967) Periodontal Disease Index. The groups were divided into four age groups: (1) adolescents: 13-18 years, (2) adults: 19-29 years, (3) mature: 30-49 years, and (4) older to senile adults: 50+ years. However, the data in Table 1 are listed only by sex and with the sexes pooled.

Table 1. Frequencies of oral conditions in Yanomama Indians.

	Surucucu n=48			Tototobi n=48		
Condition	♂	♀	♂+♀	♂	♀	♂+♀
Crowding	52.5	59.3	56.2	68.4	31.0	45.8
Overjet[1]	19.0	37.0	29.1	5.2	24.1	16.6
Overbite[1]	33.3	37.0	35.4	5.2	13.7	10.4
Crossbite[1]	33.3	33.3	33.3	21.0	6.8	12.5.
Edge-Edge[1]	4.7	14.8	10.4	15.8	3.4	8.3
Mandibular shift[1]	0.0	0.0	0.0	5.2	3.4	4.1
Diastema	0.0	7.4	4.2	0.0	27.6	12.5
Supernumerary teeth	0.0	3.4	2.0	0.0	3.4	2.0
Periodontal disease	61.9	82.7	77.0	94.4	93.1	93.6
Caries[2]	4.7	3.4	4.2	10.5	10.3	10.4

	Catrimani n=52			All tribes n=148		
Condition	♂	♀	♂+♀	♂	♀	♂+♀
Crowding	70.0	20.0	55.7	64.9	39.4	52.7
Overjet[1]	13.5	26.6	17.3	12.9	29.5	20.9
Overbite[1]	5.4	13.3	7.6	22.0	22.5	17.6
Crossbite[1]	29.7	13.3	25.0	28.5	18.3	23.6
Edge-Edge[1]	18.9	20.0	19.2	14.3	11.3	12.8
Mandibular shift[1]	5.4	0.0	3.8	3.9	1.4	2.7
Diastema	2.7	0.0	1.9	1.3	11.8	7.4
Supernumerary teeth	2.7	0.0	1.9	1.3	2.8	2.0
Periodontal disease	81.0	80.0	80.7	78.9	88.7	83.7
Caries[2]	24.3	26.6	25.0	15.6	11.3	13.5

[1]Conditions accounting for the 77.6% malocclusion in Yanomama.
[2]Frequencies are for individuals with one or more caries.

RESULTS

Malocclusion shows no significant sexual dimorphism in either the Surucucu ($\chi^2=1.77$, $p>0.05$), or the Tototobi and Catrimani ($\chi^2=2.60$, $p>0.05$). The two groups (mountain, valley) also have no significant difference in their frequencies of malocclusion ($\chi^2=0.164$, $p>0.05$). Frequencies of traits denoting malocclusion (overjet, overbite, crossbite, edge-to-edge bite, and mandibular shift) are shown in Table 1.

The incidence of caries for all of the 148 Yanomama Indians is 13.5%, which is considerably lower than had been expected (Table 1). The lowest frequency of caries in the two nutritional groups was 4.2% in the Surucucu (higher carbohydrate diet). The Catrimani and Tototobi had 25.0% and 10.4% caries, respectively. The frequency of periodontal disease is relatively uniform in the Yanomama. The Surucucu have the lowest frequency of all (77.0%). The Catrimani have 80.7%, and the Tototobi have 93.6% respectively (Table 1). The degree of attrition in the Yanomama shows an almost direct relation to age.

DISCUSSION AND CONCLUSIONS

Neither malocclusion nor severe occlusal attrition seems to seriously impair the masticatory efficiency in the Yanomama Indians. Physiological occlusal abrasion over time eliminates the tooth cusps without impairing the masticatory efficiency in any obvious way. Attrition increases with age, considerably reducing the total crown height. Physiological occlusal abrasion and vigorous mastication are seemingly beneficial to periodontal health. In addition, the amount and degree of malocclusion are not sexually dimorphic.

Admixture cannot be the primary factor in the high frequency of malocclusion, since the Yanomama have been geographically isolated for at least 500 years. Thus, neither reduced chewing not admixture explain the high frequency of malocclusion. Since tooth crowding seems to account for so much of the malocclusion, future studies are needed. These studies should concentrate on understanding the processes that determine positioning, tooth and jaw size, and the adaptive value of ideal occlusion, if any.

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BOOK REVIEWS

FORENSIC ANALYSIS OF THE SKULL. Edited by Mehmet Yaşar İşcan and Richard P. Helmer. New York: Wiley-Liss. 1993. ISBN 0-471-56078-2. 258 pp. $64.95.

The primary concern of this book is individual identification based on reconstruction of faces (in three or two dimensions) onto skulls and comparisons (superimposition) of skulls with facial photographs taken during life. Of the editors, İşcan is currently Professor and Chairman of the Department of Anthropology at Florida Atlantic University in Boca Raton, while Helmer is Professor in the Department of Experimental Forensic Medicine at the Institut für Rechtsmedizin in Bonn, Germany. Both editors have considerable experience in the field of forensic anthropology. The contents of the book come primarily from a workshop, "Advances in Skull Identification via Video Superimposition," held on August 3-5, 1988, in Kiel, Germany.

A broad range of subjects is covered, beginning with a historical overview that includes early efforts to identify the skulls, based on portraits or death masks, of Johann Sebastian Bach, Josef Haydn, and Immanuel Kant. Also included are contributions relating to basic analysis of the skull and to implementation of the latest technology in the field. Anyone interested in forensic identification will find much of interest and perhaps some techniques that they can employ in their own work.

Dental anthropologists, however, will be disappointed by the small role played by the dentition in this book. Dental development and tooth wear are important age determinants, as noted in Novotný's chapter on "Morphologic and Osteometric Assessment of Age, Sex, and Race From the Skull," and the incisors, we are told by Fedosyutkin and Nainys in "The Relationship of Skull Morphology to Facial Features", represent a useful landmark for reconstructing the philtrum. In general, however, the teeth are just there, clearly visible on photographs of skulls, but largely ignored, and nearly always hidden behind lips in facial reconstructions.

This book serves as a reminder that although forensic anthropologists and forensic dentists may both work on the same part of the skull with personal identification as a common goal and sometimes even meet in joint session at forensic meetings, they rarely actually work together. Forensic dentistry has long been a major contributor to personal identification through comparison of dental radiographs taken during life with those taken after death, unique dental pathology, visual identification of teeth exposed in photographs based on correspondence of shape, wear, spacing, etc., and bite-mark impressions left at the scene of a crime. Beyond use of the dentition to determine age at death, however, the role of dental anthropology in personal identification is less obvious. Although numerous dental traits have been used to measure biological distance

among populations, living as well as archaeological, use of these traits in a forensic context to identify race appears to have progressed little beyond the stage of "incisor shoveling equals Asiatic" versus "Carabelli's cusp equals European."

The potential exists for using dental change to reconstruct behavioral patterns based on occupation or other activities, including individual idiosyncracies, that can aid in personal identification. Teeth have already proven to be excellent sources of DNA, and it may even be possible to identify signatory chemicals from water or soil in teeth to determine where a person lived while his or her teeth were developing. This book could serve as a stimulus to get dental anthropologists interested in forensic work to organize and update their techniques, preferably in cooperation with other researchers interested in the dentition, presenting the results in a volume similar to that edited by İşcan and Helmer, thus making them generally available to the forensic profession.

Mehmet Yaşar İşcan (right), editor of *Forensic Analysis of the Skull* and founding president of the DAA, with Stanley Garn (left) and Susan Loth (center), former editor of DAN, at the AAPA meetings. Photo by A.M. Haeussler.

Readers may note an interesting personal feature on page 64 (Fig. 3). Here the facial development of the first editor can be followed through nine photographs for nearly 40 years of his life, from an 11-year-old youth with prominent ears and a "widow's peak" to the distinguished-looking, bearded colleague we recognize today.

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CULTURE, ECOLOGY AND DENTAL ANTHROPOLOGY. Edited by J.R. Lukacs. Journal of Human Ecology Special Issue No. 2. Delhi: Kamla-Raj Enterprises. 1992. ISBN 81-85264-00-9. 314 pp. Rs 550, US $60.00.

BIOLOGICAL ADAPTATIONS IN HUMAN DENTITION: AN ODONTOMETRIC STUDY ON LIVING AND ARCHAEOLOGICAL POPULATIONS IN INDIA. By S.R. Walimbe and S.S. Kulkarni. Monograph Series on Biological Anthropology, Volume 1. Deccan College PostGraduate Research Institute: Pune. 1993. 139 pp. Price: US $15.00 (cloth), US $14.00 (paper) Plus US $2.00 surface mail, US $4.00 first-class mail.

Until recent years, the role of South Asian populations in world prehistory has been neglected. Inattention to the region is surprising, since South Asia is a geographic crossroads between other key areas of study, namely, Southeast Asia, Africa and Eurasia. Two new publications from India provide an excellent overview of the current status of dental anthropological research in this important region of the world.

The main objective of *Culture, Ecology and Dental Anthropology*, edited by JR Lukacs, is "to bring current research in the dental anthropology of South Asians to the attention of a wider audience, while simultaneously bringing to the Indian subcontinent a sample of research in dental anthropology being conducted throughout the world" (p. 2). While the volume contains articles that span a wide geographic area, including Africa, Australia, Central Asia, North Asia, Europe, and North America, the majority of articles concern living and prehistoric populations of South Asia, and how cultural and ecological factors

John R. Lukacs (left), President of the Dental Anthropology Association and editor of *Culture, Ecology, and Dental Anthropology*, and Robert F. Pastor (right) at the AAPA Meetings. Photo by A.M. Haeussler.

are intimately correlated with dental data.

Examining key issues that remain unsolved in dental anthropology, the volume is divided into five sections: (1) Growth and Development of the Dentition (with articles by S.W. Hillson, K. Visweswara Rao, P. Banerjee et al., V. Kaul, J.C. Sharma, G.C. Townsend, T. Brown); (2) Dental Pathology: Past and Present (C.F. Hildebolt et al., V. Rami Reddy et al., J. Maunders et al., S.R. Walimbe and J.R. Lukacs, G. y'Edynak); (3) Odontometric Variation and Evolution (C.E. Boklage, E.F. Harris, K.A.R. Kennedy, P.W. Sciulli); (4) Patterns of Dental Attrition (S.S. Kaul and R.S. Corruccini, J.F. Van Reenen, R.F. Pastor); and (5) Morphometric Dental Variations: Population Comparisons (B.E. Hemphill et al., M.K. Bhasin and S.L. Malik, A.M. Haeussler and C.G. Turner II, N. Ohno). Within the first three sections, there are articles that deal with specific problems in methodology such as age determination from crown and root data (Hillson), alveolar bone loss quantification (Hildebolt et al.), odontometric directional asymmetry (Harris), and statistical methods to record developmental asymmetries (Boklage).

Lukacs provides a strong, cohesive approach to the often undervalued role of editor. Although most edited volumes have an Editor's Introduction, Lukacs also contributes prologues for each of the five sections. These prologues introduce the particular topic to the reader in a clear, comprehensive manner, and summarize key points of agreement/disagreement between the authors. More importantly, the prologues supply cross-references to other work that either supplement or dispute a particular author's point-of-view. This volume is a classic example of how valuable an editor's contribution can be, and Lukacs' extensive background in South Asian dental anthropology will enable even a casual reader to gain insight into the role of culture and ecology on the human dentition.

Biological Adaptations in Human Dentition: An Odontometric Study on Living and Archaeological Populations in India is an intriguing study by S.R. Walimbe and S.S. Kulkarni of Deccan College Research Institute, Pune. Initially the authors use dental metric data to examine dental reduction and its correlation with the introduction of agriculture in India. They then take the research a step farther to investigate the sociological implications of their findings on the prehistoric record.

Theories advanced by anthropologists suggest the origins of Hinduism can be traced back to the agricultural societies, particularly the early civilizations of the Indus Valley. The process of "Hinduization" or assimilation of nearby hunter-gatherer populations into these agricultural groups is often thought to be the initial stages of the caste system in India. Walimbe and Kulkarni first examine four carefully selected living populations of varying social stratification and subsistence practices, then compare the data to 20 prehistoric South Asian groups to determine if the "Hinduization" process can be supported by the dental data.

Biological Adaptations in Human Dentition contains concise, detailed information concerning methodology, provides ample tabular data, and includes an excellent section describing field techniques for making dental impressions of live subjects. Data on dental morphological traits are supplied as well. It is a fascinating example of how dental data can help resolve questions that are not always answerable by the archaeological record alone.

One thought is apparent from a reading of the two works currently reviewed: South Asia has never been static, either genetically or culturally. The words that Walt Whitman once penned remain true today - the subcontinent contains "doubts to be solv'd/ the map incognita/ blanks to be fill'd."

Many unanswered questions in this complex and important region of the world are being clarified by research such as presented in *The People of South Asia: The Biological Anthropology of India, Pakistan and Nepal* (J.R. Lukacs, editor, 1984), *Dental Anthropology: Methods and Applications* (V. Rami Reddy,

editor, 1985), and K.A.R. Kennedy's monograph on South Asian paleoanthropology (in preparation). The two new volumes discussed in this review add substantially to an understanding of one of the most challenging areas of the world for anthropological study.

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International Workshop: *Dental Anthropology*, Weimar, October, 1993

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An international meeting of physical anthropologists interested in the problems of dental anthropology was held in the historic German town of Weimar during the end of October, 1993. The sponsor was the Section for Paleoanthropology and Historical Anthropology of the *Anthropologische Gesellschaft* (Anthropological Association). Professor Dr. M. Teschler-Nicola of Vienna University and the Department of Anthropology of the Austrian Museum of Natural History in Vienna directed the scientific program. The workshop was attended by some 60 colleagues from Germany, Austria, the Czech Republic, Switzerland, and Norway.

The workshop consisted of 26 plenary session lectures with discussion, poster exhibitions, and practical demonstrations of interesting material findings, such as caries, periodontal pathology, and dental wear. The initial session, chaired by Alfred Czarnetzki (University of Tübingen), dealt with dental anatomy.

The first paper was presented by Jens C. Türp (Department of Dentistry, Albert Ludwigs University, Preiburg, Germany) who spoke on Dental Anatomy. Then Jens C. Türp and Kurt W. Alt (Department of Forensic Medicine, Heinrich-Heine University, Dusseldorf, Germany) talked on the Morphology of the Human Dentition. Micromorphology of the Tooth Enamel was the topic discussed by Ralf J. Radlanski (Section of Micromorphology, Department of Dentistry, Free University, Berlin, Germany). The final lecture was presented by M. Bujatti-Narbeshuber (Department of Anthropology, Austrian Museum of Natural Sciences, Vienna, and Department of Human Biology, University of Vienna, Austria) on Taxonomical Analysis of the Enamel Prisms in Hominoid-Hominid Evolutionary Studies.

Jens C. Türp chaired the second session, a lecture on the Evolutionary Disorders of the Teeth given by Kurt W. Alt. The third session consisted of a paper presented by W. Henke (Department of Anthropology, Johannes Gutenberg University, Mainz, Germany) on the Paleoanthropology of Dentition.

A pathology and epidemiology session was chaired by Kurt W. Alt, who also presented a paper on Granulomas and Cysts as a Sequence of Dental Decay. Three other lectures were given: (1) Dental Decay — An Interdisciplinary Problem by Dr. Norbert Baum (Langenzenn, Germany), (2) Periodontal Pathology by Thomas F. Strohm (Department of Dentistry, University, Freiburg, Germany), and (3) Jaw Tumors in Paleoanthropological Materials by Eugen Strouhal (Department of the History of Medicine, Charles University, Prague, Czech Republic).

M. Kunter chaired the fifth plenary session, covering nutrition, age, and dental wear. Five lecturers in this section were: (1) Ch. Willms (Gross-Gerau, Germany) who discussed Nutrition in Prehistory, (2) Gisela Grupe (Department of Anthropology, Munich University, Germany) who addressed Trace Element Analysis of Dental Enamel, (3) Alfred Czarnetzki (Osteological Collection, University Tübingen, Germany) who covered Dental Wear, (4) Tilmann Knoll and Manfred Kunter (Department of Anthropology, University Giessen, Germany) who presented a paper on Dental Wear in Deciduous Dentition, and (5) Jens C. Türp who spoke on The Temporomandibular Joint: Anatomy, Function and Pathology. Kurt W. Alt presented two papers, Artificial Changes in the Human Dentition and Unusual Attrition.

Friedrich W. Rösing and Maria Teschler-Nicola each headed a division of the sixth plenary session. The first part consisted of five presentations: (1) Maria Teschler-Nicola, Karin Wiltschke-Schrotta, and Margit Berner (Department of Anthropology, Austrian Museum of Natural History, Vienna, and Department of Human Biology, University of Vienna, Austria) on Sexual Diagnosis of the Teeth: Odontometry, (2) Hermann Prossinger (Department of Anthropology, Austrian Museum of Natural History, Vienna, Austria) on Methodology of the Sexual Diagnosis of the Teeth of Non-adult Individuals on the Basis of Odontometrical Data, (3) Ralf J. Radlanski on Age Assessment of the Basis of Dental Evolution and Eruption, (4) Milan Dokládal (Section of Medical Anthropology, Department of Anatomy, Masaryk University, Brno, Czech Republic) on New Data on Tooth Eruption/Emergence and Their Practical

Importance, (5) and Friedrich W. Rösing (Department of Anthropology, Human Genetics and Clinical Genetics, University Ulm, Germany) on Age Assessment of the Basis of the Dentition/Adult Individuals.

The last part of the final section included four discussions: (1) Tore Solheim (Department of Oral Pathology, University of Oslo, Norway) on Degenerative Changes of the Dental Enamel, (2) Thomas Strohm on Degenerative Changes in the Periodontium, (3) Sigmar Schnutenhaus (Blaubeuren, Germany) on Ethnic Differences in the Dentition, and (4) Kurt W. Alt on Family Analysis in Prehistoric Populations-Methods and Results.

All presented papers will be published in a special publication on dental anthropology in 1994.

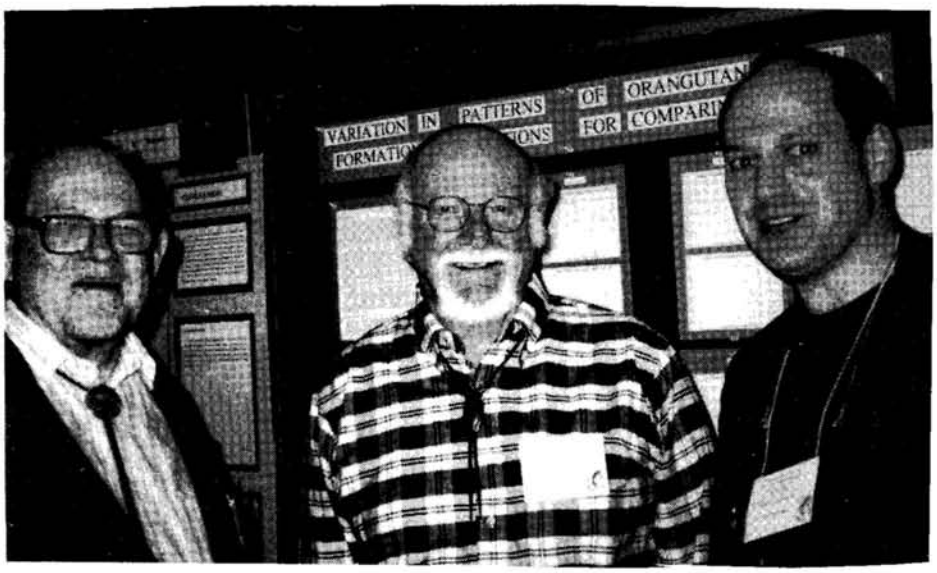
Meetings News

The **63rd Annual Meeting of the American Association of Physical Anthropologists** was held in Denver, Colorado, from March 31 to April 2, 1994. The **21st Annual Meeting of the Paleopathology Association** and the **Ninth Annual Meeting of the Dental Anthropology Association** were held in conjunction with the AAPA meeting. These meetings contained numerous presentations of interest to dental anthropologists.

The **Paleopathology Association** presented a hands-on workshop dealing with methods of identifying and scoring enamel hypoplasias. Titled, Enamel Hypoplasias: Materials and Methods, the workshop was conducted by M.E. Danforth (University of Southern Mississippi), K. Propst (Indiana University), and K. Jacobi (Indiana University). Two posters dealing with the dentition (one on enamel hypoplasia in *Dryopithecus* by M.F. Skinner (Simon Frazer University), et al. and the other on hereditary dental traits by V.F. Ridgeway and B. Lampbell) were also presented at the Paleopathology Association Meeting.

At the meeting of **American Association of Physical Anthropologists**, one organized symposium, one session of papers, and one poster session dealt strictly with dental anthropological topics. The symposium was sponsored by the Dental Anthropology Association. Organized and chaired by R.F. Pastor (Johns Hopkins University) and P.S. Ungar (Duke University), the session was titled Dental Anthropology II: New Perspectives and Approaches to Dental Microwear Analysis in Humans and Nonhuman primates, the Potential and Limitations. The poster presentation, Dental Anthropology III/Paleopathology II: Contributed Papers, was chaired by B.E. Hemphill (Vanderbilt University), and the poster session, Dental Anthropology I, chaired by K. Condon (University of Texas Southwest).

Numerous additional symposia and poster sessions contained presentations on dental anthropological subjects. Sessions on March 31 were: Human Biological Growth and Development: Modelling Relationships of Biology and Context, a symposium organized and chaired by C.M. Worthman (Emory University) and F.E. Johnston (University of Pennsylvania); Paleoanthropology II: Evolution of Prosimians and Monkeys, chaired by T.M. Cole III (Johns Hopkins University); Primates I: Cranial and Dental Anatomy, a session of papers chaired by J.W. Froelich (University of New Mexico); and Paleoanthropology III: Hominid Evidence, a paper session chaired by S.M. Ford (Southern Illinois University).



Daris Swindler (center), Past-President of the DAA, Gabriel Lasker (left), and Robert Anemone (right) before a poster co-authored by Linda Winkler, DAA Executive Board Member, and Swindler at the AAPA Meetings. Photo by A.M. Haeussler.

April 1 sessions relating to some aspect of dental anthropology included Paleoanthropology V: Comparative Paleoecology in Primate and Human Evolution, a symposium organized and chaired by M. Gagnon (University of Toronto) and K.E. Reed (State University of New York, Stony Brook);

Skeletal Biology II, a session of papers chaired by D.H. Ubelaker (Smithsonian Institution); and Paleoanthropology VI: Early Hominid Evolution, papers chaired by L.C. Aiello (University College, London). On April 2 one session, Paleoanthropology IX: Late Hominid Evolution, chaired by J-J. Hublin (Musée de l'Homme), contained papers on dental anthropological subjects.

Eight poster sessions contained presentations on subjects related to dental anthropology. These were: Skeletal Biology I, chaired by S.R. Saunders (McMaster University); Paleopathology Posters I, chaired by E. Braunstein (University of Indiana); and Paleoanthropology IV: Late Hominid Evolution, chaired by K.R. Gibson (University of Texas Dental Branch, Houston); Primates II: Biological Variation, chaired by E. Strasser (California State University, Sacramento); Skeletal Biology III, chaired by S. Stout (University of Missouri, Columbia); Paleoanthropology VII: Primate and Early Human Evolution, chaired by A.B. Falsetti (University of New Mexico); Primates vs Behavior, chaired by P.S. Rodman (University of California, Davis).

In all, 55 members of the Dental Anthropology Association made presentations at the AAPA meeting. Abstracts with authors' names and addresses can be found in the *American Journal of Physical Anthropology Supplement 18* (1994).

From April 20 to 24, two additional annual meetings took place in Anaheim, California. These were the **59th Annual Meeting of the Society for American Archaeology** (SAA) and **Third Annual Meeting of the Paleoanthropological Association.** At the SAA meetings, papers dealing with dental anthropological subjects were Dental Enamel Hypoplasia as an Indicator of Physiologic Stress in a Skeletal Series from Malheur Lake, Oregon by G.C. Nelson (University of Oregon) and Skeletal and Dental Indicators of Health among the Salado from Tonto Basin, Arizona by M.Regan, J. Irish, and CG Turner II (Arizona State University). A symposium on Recent Studies of Ancient Maya Skeletons organized by S. Whittington and D. Reed contained papers dealing with dental anthropological issues. At the Fryxell Symposium (Bone Chemistry and Human Diet) which honors scientists whose interdisciplinary research has made important contributions to archaeology, P. Walker and F. Drayer (University of California, Santa Barbara) presented preliminary results from their latest electron microprobe research suggesting spatial variation in the distribution of chemicals within enamel as an index of temporal variation in diet.

At the **Paleoanthropological Association** meetings one paper dealt with the dentition. This was a presentation by R. Protsch and V. Zeiten reassessing the position of *Homo erectus heidelbergensis*.

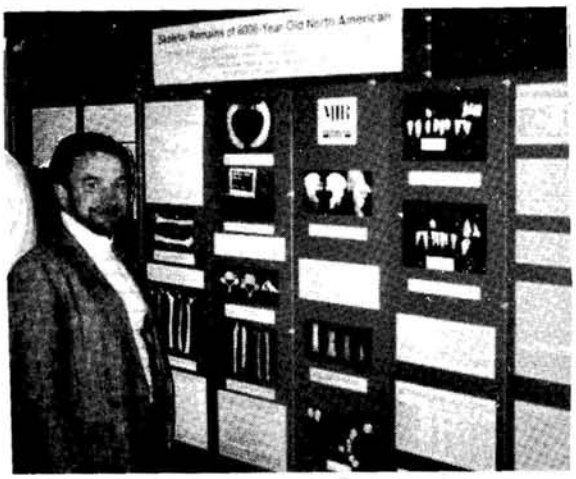
In Spokane, Washington, at the **47th Annual Northwest Anthropological Association** meetings, G.L. Tasa (University of Oregon) presented a paper, Three-rooted Mandibular Molars and their Incidence in Southern Northwest Coast Populations: Implications for Southern Oregon Prehistory and for the Peopling of the New World.

At the **1st Turkish Congress of Forensic Sciences** held from April 12 to 15, 1994, in Ankara, Turkey, Yaşar İşcan (Florida Atlantic University) presented an invited lecture on Identification of Human Skeletal Remains. İşcan and Erksin Gulec (University of Ankara) also organized a workshop, Practical Forensic Anthropology for Forensic Medicine Interns.

Christy G. Turner II (Arizona State University) presented an invited paper titled Shifting Continuity at the symposium, **The Origin and Past of *Homo sapiens sapiens* as Viewed from DNA — Theoretical Approaches**. The symposium was organized by Kazuro Hanihara and sponsored by the International Institute of Advanced Studies, Kyoto. The symposium was summarized by Sydney Brenner, Medical Research Council, Cambridge University, UK: (1) The molecular clock is not reliable. (2) Selection could be very important for mitochondrial DNA. (3) Since mitochondrial DNA controls metabolism, climate could be influential or related to its variation. (4) Look for DNA that grows teeth. Do molecular dental anthropology, since teeth seem to be a powerful paleontological tool.

Dental Anthropology Association Member News

Transitions: **Lassi Alvesalo** was named dean of the Institute of Dentistry of the University of Oulu, Finland, in January, 1994. **Phillip Tobias** has retired from the University of the Witwatersrand after 51 years of service, a great deal of it as dean of the Medical School. Tobias has been appointed Professor Emeritus of Anatomy and Human Biology and a Honorary Research Fellow at Witwatersrand. He will also continue as Honorary Director of the Paleo-anthropology Research Unit. In June he will receive an honorary doctorate from the University of Pennsylvania.



Charles Hildebolt at the AAPA meetings before poster he authored with W.M. Murphy, R.T. Rasmussen, and A.M. Haeussler. Photo by A.M. Haeussler.

Erksin Gulec (University of Ankara) reports that the Arizona State and Dahlberg dental casts are now being used by graduate students in the University of Ankara Physical Anthropology Department.

A National Science Foundation Dissertation Research Grant was awarded to **Diane Hawkey** (coPI) and **Christy G. Turner II** (PI) (Arizona State University) for Hawkey's research on Sundadonty in prehistoric and recent South Asian populations. Hawkey has just returned from collecting data in India on an American Institute of Indian Studies Predoctoral Fellowship and will examine dental morphology of South Asian specimens located in England, Switzerland, and New York.

Brian Hemphill (Vanderbilt University) will gather dental and skeletal morphometric data in Samarkand, Uzbekistan, and Ashkhabad, Turkmenistan, between May 10 and July 10, 1994. In Samarkand Hemphill will work with Timor Shirinov of the Institute of Archaeology of the Uzbekistan Academy of Sciences and examine late Chalcolithic and Early Iron Age skeletal collections. The purpose is to determine whether peoples of the Bactrian Margiana Archaeological Complex were associated with the origins of alleged Indo-Aryan migrants who were on their way to Iran and the Indus Valley. In Ashkhabad Hemphill will work with Valeri Guliaev, Deputy director of the Institute of Archaeology of the Russian Academy of Sciences, Moscow. He will examine Late Bronze-Early Iron Age skeletal materials from the Don River Valley, Russia, in order to assess whether they may have belonged to individuals engaged in a westward movement of the same group. Hemphill's work is funded by the Vanderbilt University Research Council and the Mellon Foundation.

According to **Mehmet Yaşar İşcan** (Florida Atlantic University), *Reconstruction of Life from the Skeleton*, which he edited with **Kenneth A.R. Kennedy** (Cornell University) in 1989, is now in its second printing with a minor change of the name of the publisher (Alan R Liss to Wiley-Liss) on the cover.

Kenneth Jacobs (Universite de Montreal) has received grants from IREX (1994) and from the Social Sciences & Humanities Research Council of Canada (for 1994-1997) in order to study collections in several of the European successor states to the former USSR. The project will attempt to assess the biological impact of this region's social and economic transformation during the Mesolithic through Bronze Age using a wide range of morphological, metric, and osteochemical variables. Funding will also cover participation in several congresses, including The Indo-Europeanization of Northern Europe in Vilnius in September, 1994, and the 8th International Congress for Feno-Ugric Studies in Jyvaskyla, Finland in August, 1995. Jacobs was also voted president-elect of the Northeast Archaeological Association at its annual meeting in April.

John R. Lukacs (University of Oregon), with the support of the National Geographic Society, spent the month of March, 1994, at the University of Allahabad in north-central India. Lukacs conducted an analysis of human skeletal and dental remains from the rock shelter site of Lekahia, located in the Kaimus Hills, 100 km south of the city of Allahabad. This research was in collaboration with Drs. J.N. Pal and V.D. Misra of the Department of Ancient History, Culture, and Archaeology of the University of Allahabad.

Lukacs together with **G. Richard Scott** (University of Alaska-Fairbanks) is organizing a Dental Anthropology Association-sponsored symposium in memory of Albert A. Dahlberg for the 1995 AAPA meetings. **Brian Hemphill** is organizing a DAA-sponsored poster session (see page 18).

On May 3, 1993, as the results of the elections in South Africa were becoming known, **Jeff McKee** (University of the Witwatersrand) wrote: "Things in this part of the world (southern part of the continent) are great. Crime is down; terrorism is down; people's spirits are up! I got to vote in the election... it was a tremendous feeling taking part in a new democracy — a new country. I waited in line at the poling station for 3½ hours; it was a carnival-like atmosphere with blacks and whites all having a good time together. I hope things stay this way."

Rosine Orban (Institute Royal del Sciences National de Belgique) is the general editor of a series of publications: *Hominid Remains: An Up-date*. The books add recent information to the catalogues of fossil

human remains by Molleson, Oakley, and Campbell (*Catalogue of Fossil Hominids*: Parts I, II, and III I, published in London by the British Museum in 1971, 1975, and 1977); and Newell, Constandse-Westerman, and Meiklejohn (The Skeletal Remains of Mesolithic Man in Western Europe: An Evaluative Catalogue, published in the *Journal of Human Evolution* (Vol. 8, nos 3-4) in 1979. The format of the text follows that set by Oakley (1971) for the *Catalogue of Fossil Hominids*.

Phillip Walker, DAA President-Elect, at the AAPA Meetings. Photo by A.M. Haeussler.

The updated books are particularly useful to anthropologists planning to do field research and to those supplementing their current information. Of special interest to dental anthropologists are the photographs of recently excavated specimens, such as the Dmanisi *Homo erectus* mandible (with dentition) from Georgia and the drilled adult tooth from Saint-Germain-la-Rivière from France. Six books have been published during the past five years. These are *Italy* No. 1 published in 1988, *Canada* No. 2 in 1989, *British Isles and Eastern Germany* No. 3 in 1990, *Spain* No. 4 in 1991, *Armenia, Azerbaijan, Georgia, Russia, Ukraine and Uzbekistan* No. 5 (by H. Ullrich) in 1992, and *France Upper Paleolithic* No. 6 (by D. Gambier and F. Houet) in 1993. Books in preparation deal with China, the Czech and Slovene Republics, and Tanzania. Individuals wishing to obtain these volumes should contact Orban at the Laboratoire d'Anthropologie et Génétique Humaine, 50 Avenue F.D. Roosevelt (C.P. 192), Université Libre de Bruxelles. B-1050, Bruxelles, Belgium. Price per volume within Europe is 250 Belgian francs for Nos. 1 to 5 and 300 for No. 6. An additional 50 Belgian francs per volume is charged for copies sent outside of Europe. Students pay the European rate.

In February, 1994, **Robert Pastor** (Johns Hopkins University) spent two weeks in Costa Rica with **Mark Teaford** and Ken Glander (Duke University) making dental impressions of howler monkey teeth for analysis of microwear associated with forested and open habitats. They will be returning during the wet season in July to collect data on seasonal differences in microwear and diet. Pastor is also assisting in additional studies in Teaford's laboratory: investigation of malocclusion, bruxism, and psychological stress among dental patients from Wales (collaborative clinical study with Columbia University researchers), North America (with the University of Rochester), and Saudi Arabian men who consume a traditional diet; a dental morphometric and microwear study of African Plio-Pleistocene and modern monkeys (in collaboration with Meave Leakey); and research and development of new techniques and methods for collecting and analyzing microwear data.

Joseph F. Powell and **D. Gentry Steele** (Texas A&M University) are continuing their research on the biology of early Holocene human populations in the Americas. Powell recently was awarded a 1993-1994 Texas A&M University Dissertation Award, an L.S.B. Leakey Foundation research grant, and a pre-doctoral research grant from the Wenner-Gren Foundation to investigate metric and nonmetric dental variability among early and middle Holocene populations in North America. He recently examined early dental remains from a number of sites in Florida, including Warm Mineral Springs, Little Salt Spring, Windover, Tick Island, and Cutler Ridge. He completed a re-analysis of Christy G. Turner's dental data for North American populations, and co-authored an article with Steele on the biology of the First Americans (see *Recent Publications).*

Christy G Turner II (Arizona State University) has been awarded a grant from the National Geographic Society. Purpose of the funding is to further Turner's investigations into violence and cannibalism in the American Southwest and Mexico.

Phillip Walker (University of California, Santa Barbara) has received an IREX grant for use in developing a collaborative research project on the bioarchaeology of Central Asian steppe populations with Dr. Leonid Yablonski of the Russian Academy of Sciences. The goal of the project is to use an interdisciplinary approach that integrates data from dental, osteological, and archaeological sources to reconstruct the history of steppe populations living at the boundary between Europe and Asia.

Passings: **Kees Korenhof** was known internationally for his research on the evolutionary aspects of the dentition. He worked at the Dental Institute Rijks University, Utrecht, Netherlands, until its close in 1988. **Arkady R. Kim** was director of the Department of Archaeology of Altai State University, Bernaul, Russia. The next issue of the newsletter will contain obituaries.

Call for Poster Presentations

64th Annual Meeting American Association of Physical Anthropologists, Oakland, California

Brian Hemphill

The Dental Anthropology Association would like to raise its profile at the AAPA Meetings and needs your help in order to do so. In addition to sponsoring a podium symposium in honor of Albert Dahlberg, the DAA will sponsor an expanded poster session under the direction of Brian Hemphill (Vanderbilt University). The goal of this poster session is to provide some unity of dental anthropological papers in what has proven to be a very effective medium. Rather than having dental anthropological papers scattered all about in a number of sessions, Hemphill would like to have a substantial proportion of these presentations made at the same time. This type of session would simplify the process of viewing most of the relevant posters by those interested in dental anthropology. In addition, a large session would foster further communication among AAPA members interested in dental anthropology.

Hemphill is seeking posters that address the following areas of concentration within dental anthropology: (1) Dental Evolution and Tooth Formation, (2) Dental Genetics, (3) Dental Morphology, (4) Odontometrics, (5) Dental Pathology, and (6) Occlusion and Orofacial Mechanics/Anatomy. All interested individuals should contact: Brian Hemphill, Department of Anthropology, Box 6050-B, Vanderbilt University, Nashville, TN 37235, U.S.A. (Telephone 615-343-6120).

Dental Anthropology Newsletter Section

A.M. HAEUSSLER

Tasman Brown is now a member of the editorial board. Brown recently retired from the School of Dentistry of the University of Adelaide. Editorial board members serve as an advisory capacity on issues of operational and editorial policies.

Members of the Dental Anthropology Association (DAA) are invited to send short articles, news, and citations of recent publications. Deadlines for manuscripts are December 15, April 15, and September 15. Manuscripts on diskette (IBM format) or email ere especially welcome. Text can be sent via email to AGAMH@ASUACAD or by ordinary mail to the Department of Anthropology, Arizona State University, Box 872402, Tempe, Arizona 85287-2402, U.S.A. DAA members are also invited to nominate colleagues, students, and their dentists to receive a complementary newsletter issue.

The following policies were adopted by the *Dental Anthropology Newsletter* at the meeting of the DAA executive committee meeting on March 31, 1994.

Beginning with this issue the *Dental Anthropology Newsletter* will be sent by surface mail to members living outside of the United States, Canada, and Mexico. Individuals wishing to receive the newsletter by airmail may add an additional $5.00 per year mailing charge to their annual dues.

Starting with Volume 9, Number 1, the *Dental Anthropology Newsletter* will be sent only to individuals who are current in paying their dues or in their sponsorship status. Membership status can be found on the year listed after the name on the address label on the envelope and on the yellow membership form included with this issue. By adopting these two policies, the DAA was able to avert a raise in dues. Money on hand and dues should be sufficient to cover the estimated 1994-1995 newsletter budget of $2,178.60 for three 24-page issues, which was presented to the DAA executive committee.

Henceforth, the dateline of the newsletter will contain the volume, issue number, and year, but not the month. Omission of the month of issue is purely cosmetic, because surface mail delivery can require several months. The newsletter will continue to be mailed out the middle of January, May, and October.

The newsletter will no longer print advertisements because of rules of the Bulk Mail Department of the Arizona State University Post Office. Since the advertisements in the newsletter have been a major source of information about new books, copies of the DAA membership list will be released to publishers who request it. However, the membership list will be provided *only* for the purpose of disseminating information about new publications dealing with dental anthropology. A handling fee will be charged by the DAA.

The editors listed on the masthead consist of graduates and graduate students in the Department of Anthropology at Arizona State University. Four years ago, the minutes of the DAA stated that the editor would have the help of a "group of dental anthropology graduate students..." At the present time both the individuals listed on the masthead and their duties are more diverse than they were four years ago. According to policy beginning with Volume 9(1), editors are individuals in the Department of Anthropology at ASU who regularly assist the elected editor in a meaningful manner with the day to day operations of the

newsletter. Editors who are temporarily absent doing field research retain their positions. Present editors are Joel D. Irish, Diane E. Hawkey (who have each worked on the newsletter for four years), Shara Bailey-Schmidt, Esther Morgan, and Korri Dee Turner. DAA member Rhea Jacanin is computer consultant.

Minutes of the Ninth Annual Meeting of the Dental Anthropology Association Denver, Colorado — April 1, 1994

I. PRESIDENTIAL ADDRESS (Stephen Molnar):

A. Opening Remarks: The meeting was opened with a moment of silence in memory of Albert A. Dahlberg.

B. Agenda Outline: Old Business, Reports of Secretary-Treasurer and Newsletter Editor, and New Business.

II. OLD BUSINESS

A. New DAA Position: President-Elect: Last year Linda Winkler (Executive Board Member) proposed that the DAA institute a new elected position: President-Elect. The President-Elect would be nominated and elected during the same election as the new President. The President-Elect would then assume the Presidency following the two-year term of the President. It is felt that the President-Elect position would: 1) ease the transition between Presidents, and 2) provide a stand-in in the event that the President is unable to perform his or her duties. The President-Elect would also serve on the Executive Board, which currently consists of the President, Secretary-Treasurer, *Dental Anthropology Newsletter* Editor, and Executive Board Member.

In order to allow the creation of this new position, the current by-laws needed to be changed at the current 1994 meeting. Philip Walker made a motion to vote on this amendment, which was seconded. The motion passed by a two-thirds majority vote of the members present. Thus, the new position and the by-law change were instituted.

B. 1994 Elections: Nominations were received by Linda Winkler, Executive Board Member, following the 1993 meeting for three positions in the 1994 elections: 1) John Lukacs for DAA President (2 years), 2) Philip Walker for the new DAA President-Elect (2 years) (see above), and 3) Sue Haeussler for *Dental Anthropology Newsletter* Editor (4 years). No new nominations were received from the floor at the current 1994 meeting. Marie Danforth made a motion to vote on the three positions. The motion was seconded. All three individuals were elected to their respective positions by a two-thirds majority vote of the members present.

III. REPORT OF THE SECRETARY-TREASURER (Joel D. Irish):

A. Status of the Treasury: As of April 1, 1994, the Association's net assets are $1,642.59. Each DAN issue costs roughly $405.00 for publication (24 pages) and $280.00 for foreign printed matter airmail postage. In addition, the DAN Office has other expenses, including phone charges, office supplies, and other miscellaneous supplies. The Arizona State University Anthropology Department provides bulk mailing for U.S. members. Thus, we have enough money to publish the next two issues of DAN. However, beginning with the last issue, we were forced to mail the Newsletter overseas via boat mail rather than air mail to lower costs. Future issues, and the use of overseas air mail will need to be funded by membership dues from continuing and delinquent U.S. and foreign members (see Newsletter Editor Report below). In addition, a cash bar reception was arranged for the current 1994 meeting by Executive Board Member, Linda Winkler. The cost of the bar was $40.00, which was taken out of the general treasury fund. The general consensus of members in attendance concerning the presence of the cash bar was positive.

Joel D. Irish, DAA Secretary-Treasurer (left), with Joseph F. Powell (center) and Brian E. Hemphill (right) at the AAPA Meetings. Photo by A.M. Haeussler.

B. Membership Status: As of April 1, 1994, the DAA has 296 members — down 17 from one year ago. During the past year we acquired 27 new members, but were forced to drop 44 non-paying individuals. They did not respond to requests for payment nor did they request sponsorship. Of the 296 members, 183 (62%) of the 296 members are from the U.S., and 113 (38%) are from one of 25 foreign countries. Only 177 (60%) members are paid up through 1994; 119 (40%) members are delinquent (81 U.S. individuals and 38 foreign individuals). DAA members are urged to pay their dues, and are also encouraged to donate to the Foreign Membership Fund to help defray the cost of overseas mailing. We thank those members who are paid up, and especially thank those who have contributed extra cash. Members are asked to check the cover of the May Newsletter to determine your status. If "MEMBERSHIP FEES PAST DUE" appears stamped in red, remit $10.00 for Regular Membership, $5.00 for Student Membership, or request Sponsored Membership from the Secretary-

Treasurer. Please note that the DAA has not increased membership dues since its inception in 1986 despite yearly increases in the cost of publishing DAN. Payment in U.S. funds is preferred, but an equivalent amount in foreign funds is acceptable.

IV. REPORT OF THE *DENTAL ANTHROPOLOGY NEWSLETTER* EDITOR (Sue Haeussler):

A. Overseas Mailing: Beginning with the last issue, DAN is being mailed overseas via boat mail rather than air mail to save money. However, those overseas members who wish to have their Newsletter sent to them via air mail may still do so if they include an extra $5.00 with their annual membership fee. All membership and airmail fees should be sent to the attention of the Secretary-Treasurer.

B. Change in DAN Issues: Beginning with the new issue of DAN, the month (i.e. January, May, and October) will no longer be found on the dateline. Only the appropriate volume and number will be listed.

C. Acknowledgements: It was noted that the Arizona State University Department of Anthropology (ASU) pays the DAN bulk mailing costs for all U.S. members, and supplies the mailing envelopes. ASU also donated $500.00 for publication of the Albert A. Dahlberg issue. Contributions to the *Dental Anthropology Newsletter* over the past four years by editors Joel Irish, Diane Hawkey, Steve Street, Edwin Crespo, Liu Wu, and more recently Esther Morgan, Shara Bailey-Schmidt, and Korri Turner were recognized.

V. REPORT OF THE EXECUTIVE BOARD MEMBER (Linda Winkler):

A. Meeting Day: Future Dental Anthropology Association Annual Business Meetings will be held on Thursday rather than Friday nights to avoid time conflicts with late symposia, and because the AAPA Business Meeting is also held on Friday nights.

B. DAA Reception: Future DAA Business Meetings will be followed by a reception, which will hopefully include a cash bar (This, of course, depends on the status of the Treasury to pay for the service).

VI. NEW BUSINESS:

A. 1995 Election Nominations: Two elected offices need to be filled at the 1995 Annual Meeting in Oakland, California: Secretary-Treasurer and Executive Board Member. Joel Irish nominated Brian Hemphill for the position of Executive Board Member. This nomination was seconded. Other nominations should be sent to Linda Winkler, at the University of Pittsburgh at Titusville.

B. 1995 Albert A. Dahlberg Symposium: John Lukacs suggested the 1995 AAPA Meeting include a dental anthropology symposium in honor of the late Albert A. Dahlberg. Sue Haeussler made a motion to institute such a symposium. The motion was seconded. Brian Hemphill suggested that the session should be chaired by the DAA president so that DAA members can be more involved in the AAPA session process. Linda Winkler noted that all details of the symposium be communicated to her so it can be listed as a DAA sponsored event in the 1995 program.

C. 1995 DAA-Sponsored Poster Session: Brian Hemphill suggested that a dental anthropology poster session be organized for the 1995 AAPA meeting. He also volunteered to chair the session.

D. Submission of News for DAN: Sue Haeussler requested that members send news briefs for inclusion in the Newsletter. In particular, news about dental research from throughout the U.S. and overseas is requested so as to keep DAN readers informed. Linda Winkler followed up by noting that zoo personnel often do a great deal of research with primate teeth, yet they have little say in the DAA. She requested that members send her any such information, from which she could write an article for DAN about who is working with primate dentitions.

E. Potential New DAA Members: Phil Walker requested that members send suggestions for new members to the Secretary-Treasurer. Complimentary copies of the Newsletter would then be sent to these potential members to entice them into join the Dental Anthropology Association.

A motion for adjournment of the Ninth Annual Dental Anthropology Association Business Meeting was asked for by Stephen Molnar. Such a motion was made from the floor and was seconded.

Minutes prepared by Joel D. Irish
Submitted April 18, 1994.

RECENT PUBLICATIONS

Aasheim B, and Ogaard B (1993) Hypodontia in 9-year-old Norwegians related to need of orthodontic treatment. Scandinavian Journal of Dental Research *101(5)*:257-260.

Akazawa T, Dodo Y, Muhesen S, Abdulsalam A, Abe Y, Kondo O, and Mizoguchi Y (1993) The Neanderthal remains from Dederiyeh Cave, Syria. Interim report. Anthropological Science *101(4)*:361-387.

Alvarez JO, Caceda J, Woolley TW, Carley KW , Baiocchi N, Caravedo L, and Navia JM (1993) A longitudinal study of dental caries in the primary teeth of children who suffered from infant malnutrition. Journal of Dental Research *72(12)*:1573-1576.

Antoniades K, Tsodoulos S, Karakasis D (1993) Totally submerged deciduous maxillary molars - case reports. Australian Dental Journal *38(6)*:436-438.

Arriaza BT, Merbs CF, and Rothschild BM (1993) Diffuse idiopathic skeletal hyperostosis in Meroitic Nubians from Semna South Sudan. American Journal of Physical Anthropology *92(3)*:243-248.

Becker MJ (1993) Human skeletons from Tarquinia: a preliminary analysis of the 1989 Cimitero site excavations with inferences for the evaluation of Etruscan social classes. Estudi Etruschi *58(1992)*:211-246.

RECENT PUBLICATIONS

Benefit BR, and McCrossin ML (1993) Facial anatomy of *Victoriapithecus* and its relevance to the ancestral cranial morphology of Old World monkeys and apes. American Journal of Physical Anthropology *92(3)*:329-370.

Bjarnason S, Kohler B, and Wagner K (1993) A longitudinal study of dental caries and cariogenic microflora in a group of young adults from Goteborg. Swedish Dental Journal *17(5)*:191-199.

Blakley ML, Coppa A, Damadia S, and Vargiu R (1990) A comparison of dental enamel defects in Christian and Meroitic populations from Geili, Central Sudan. International Journal of Anthropology *5(3)*:193-202.

Bolin A, Eklund G, Frithiof L, and Lavstedt S (1993) The effect of changed smoking habits on marginal alveolar bone loss - a longitudinal study. Swedish Dental Journal *17(5)*:211-216.

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