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Directions in Dental Anthropological Research in Hungary, with Historical Retrospect

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BRIEF HISTORY OF ANTHROPOLOGY

Anthropology as a science began to develop rapidly in Hungary during the middle and latter part of the 19th century. The Eighth World Congress of Prehistory and Anthropology, held in Budapest in 1876, stimulated this development. The congress aroused the interest of many individuals working in different fields of anthropology, most notably S. Scheiber, the anthropologist (Scheiber, 1873); F. Römer, the archaeologist (Eiben, 1988); and J. Lenhossék, the anatomist (Lenhossék, 1875).

The intellectual endeavors of scientists, together with changes in international relations, resulted in the establishment of the Department of Anthropology at Péter Pázmány University of Natural Sciences in Budapest in 1881. Aurél Török (1842-1912) was the first university professor in the department. Previously, he had worked in the Department of Forensic Medicine, Pathology, Anatomy, and Physiology of the Medical Academy in Kolozsvár. Török had obtained much of his knowledge during trips abroad (Paris), where he studied human anatomy and biology. Thus, his published works deal with paleopathology and the study of the human skull (Török, 1882, 1890, 1898, and 1899).

EARLY ANTHROPOLOGISTS

Between World Wars I and II, M. Lenhossék (1836-1937) investigated hominid evolution and paleoanthropology (Lenhossék, 1915, 1917, 1917a, 1918, 1919, 1920, 1921, and 1922). After 1940, L. Bartucz (1885-1966), who had been a professor at the Institute of Anthropology in Budapest since 1931, directed the Institute of Anthropology in Szeged. To improve the teaching of anthropology at the university, Bartucz distributed lecture notes about topics of anthropology and human evolution. Bartucz' (1914, 1935, and 1966) publications stand out in the field of paleoanthropology, and the data in his 1966 monograph on prehistoric trepanation are especially noteworthy.

M. Malán (1900-1968) was another important anthropologist of this century. He organized a modern Institute of Anthropology and established anthropological education and research at the University in Kolozsvár. (Kolozsvár in Transylvania had been reannexed to Hungary). Later, Malán directed the Institute of Anthropology in Budapest, after the retirement of Bartucz.

J. Nemeskéri (1914-1990), a student of Bartucz, was lecturer and non-staff teacher at the University in Debrecen. He was also director of the Demographic Research Institute of the Central Statistical Office. In 1959, Nemeskéri contributed to the success of the symposium, "Anthropological Questions of the Carpathian Basin", held in Budapest. A similar symposium, "Evolutionary Trends in Fossil Hominids" was held in 1967 in Budapest and Eger. Seven years later in 1974, two international series of lectures were given: "The Question of Age and Sex Determination" in Budapest and "Paleodemography" in Sárospatak. His major publications are Nemeskéri (1943, 1947; Nemeskéri and Harsányi, 1968; Nemeskéri and Dezsö, 1969; and Nemeskéri, Harsányi, and Acsadi, 1960).

UNIVERSITIES AND MUSEUMS

The scientific activities of anthropologists in the departments of anthropology in the three universities and the larger museums were noteworthy. In 1975, D.G. Eiben took over as director of the Institute of Anthropology in Budapest. On the basis of his position and activities, he is considered the directing personality of anthropology in Hungary. His research has been directed mainly toward physical anthropology, biology, and human ecology (Eiben, 1982, 1988).

Meanwhile, P. Lipták succeeded Bartucz as director of the Department of Anthropology of Attila József University of Science (JATE) in Szeged. His interests have focused on anthropological taxonomy and paleoanthropology (Lipták, 1967, 1969, 1976). In 1969 Lipták published, *Anthropology and Human Evolution*, the first anthropology textbook printed in Hungary. Another of his books, *Avars and Ancient Hungarians* (Lipták, 1983), deals with the origin of the Hungarian People on the basis of osteological discoveries and evidence from linguistics, archaeology, ethnography, and other prehistoric information.

Gy. Farkas has directed the Department of Anthropology in Szeged since 1980. His scientific work is aimed at investigation of prehistoric skeletal material in the southwestern part of the Hungarian plain in order to obtain data on growth, maturation, and acceleration rate of juveniles (Farkas, 1969, 1972; Farkas and Marcsik, 1975, 1979).

I. Lengyel (1970-1992) gave special lectures on results of paleo-serological studies, which he carried out at the Department of Anthropology in Szeged and later in Budapest. These results have been described in a monograph *Paleoserology, Blood Typing with the Fluorescent Antibody Method* (Lengyel, 1975).

DENTAL ANTHROPOLOGY

Dental anthropology is not completely isolated from the science of anthropology, yet to some extent it is an independent unit. In Hungary dental anthropology encompasses three specialties: anthropology, stomatology (dentistry), and forensic anthropology (forensic osteology and stomata-odontology). Nearly all researchers dealing with anthropology are interested in dental anthropology. Evidence can be found in Kocsis' (1989) literature review and bibliography, which contains 172 citations of publications about maxillary and mandibular morphology, dental morphology, mandibular pathology, dental morphological feature, dental caries, tooth wear, periodontal lesions and periapical changes, illness and dental development, and pseudopathological deformations from data from Hungarian excavations.

Research Cited in Kocsis (1989)

Publications on maxillary and mandibular morphology discussed in Kocsis' review (1989) are works by Apor (1943), Balogh and Csiba (1966), L.Bottyán (1968, 1970a, 1970b, 1971, 1973, 1974a, 1974b, 1975), Dobrovits (1966), Dobrovits and Kemény (1971), Farkas and Marcsik (1979), Finnegan and Marcsik (1979, 1980), Földes et al., (1981), Kollár (1948), Könegyi and Marcsik (1976), Lang (1955), Lenhossék (1915, 1917a, 1917b, 1918, 1919, 1920, 1921, 1922), Nitsche and Vályi (1958), Prágai (1982), Prágai and Fazekas (1982, 1983), Regöly-Mërei and Nemeskëri (1958a, 1958b), Rudas (1989a, 1989b), Simon and Kömives (1937), Somogyi (1953), Szabö and Doby (1972), Szokolóczy-Sillaba (1937, 1939, 1953), Tamás (1986), and Török (1882, 1890, 1898, 1899).

Publications on pathology are those by Berndorfer (1962), Jójárt (1988), Kemenes (1970), Marcsik (1976, 1983), Marcsik and Kocsis (1985), Nemeskéri (1943, 1947), Nemeskéri and Harsányi (1968, 1969), Regöly-Mérei and Nemeskéri (1958a, 1958b), Somogyi (1953), and Schranz (1953). Works on dental morphological structures are those by Alaodiatoris (1937), Bartucz (1914, 1935, 1966), Hillebrand (1908a, 1908b, 1909), Iszlay (1881a, 1881b), Lenhossék (1985, 1915, 1917a, 1917b, 1918, 1919, 1920, 1921, 1922), Malán (1944, 1955, 1961), Molnár and Huszár (1953), Salamon (1923, 1938, 1940a, 1940b, 1941, 1942), Schranz (1953, 1956, 1962, 1964, 1967, 1988), Schranz and Huszár (1954, 1955, 1958, 1962), Szabó (1934, 1935), Thoma (1963, 1966, 1967), and Török (1882, 1890, 1898, 1989). Works on dental caries have been published by Brabant (1962, 1971), Brabant and Nemeskéri (1963), Bruszt (1950a, 1950b. 1950c, 1952, 1953a, 1953b, 1954, 1958, 1963, 1966, 1975), Bruszt and Könegyi (1963), Endrësz (1986), Éry (1971, 1981, 1982), Hillebrand (1908a), Huszár (1945, 1951, 1961, 1963, 1965, 1966, 1967, 1968, 1972, 1974a, 1974b, 1976), Huszár and Schranz (1952), Kiszely (1966), Kollár (1948), Lenhossék (1919), Schranz (1956, 1962, 1964, 1964, 1988), Schranz and Huszár (1954, 1955, 1958, 1962), Szikáry and Huszár (1933), Tóth (1966a, 1966b, 1966c, 1967a, 1967b, 1967c, 1967d, 1968, 1970a, 1970b), and Tóth and Sonkodi (1972).

Works on the cultural history of dental wear are those by Huszár and Schranz (1954), Mathé and Molnár (1940), Molnár (1939), and Schranz and Huszár (1954, 1955). Works on periodontal lesions and periapical changes have been written by Pap (1986) and Szarvas (1981). Publications on disease and developmental anomalies are those by Arkövy (1904a, 1904b), Hajós (1989), Kocsis (1989), Kocsis and Marcsik (1979, 1980, 1981, 1982, 1983a, 1983b, 1987, 1989, 1991), Kocsis and Mari (1988), Kocsis and Trogmyer (1986), Kocsis, Marcsik, and Mann (1992), and Salamon (1923, 1938, 1940a, 1940b, 1941, 1942).

Work by Dentists

Dentists (stomatologists), who are experts at dental anthropology, have worked at four Hungarian medical universities and three dental clinics. D. Schranz, Gy Huszár, and G. Szabó have worked at the Dental Clinic of Semmelweis Medical University. Previously, P. Adler and A. Szentpéteri worked at the Stomatological Clinic of the Medical University in Debrecen. D. Hattyasy, S. Pónyi, K. Tóth, and G. Prági have worked at the Dental Clinic of Albert Szent-Györgi Medical University in Szeged. Presently, A. Mari, A. Fazekas, and G.S. Kocsis work there. Publications include those by Schranz (1953, 1956, 1957, 1962, 1988); Schranz and Huszár (1954, 1955, 1958, 1962), Pónyi and Nyilasi (1971) Pónyi and Szabó (1989), Tóth (19661, 1966b, 1966c, 1967a, 1967b, 1967c, 1967d, 1968, 1970a, 1970b, 1980/81), Tóth and Sonkodi (1972), Kocsis (1988, 1989), Kocsis and Marcsik (1979, 1980, 1981, 1982, 1983a, 1983b, 1987, 1989, 1991), Kocsis and Mari (1988), Kocsis and Trogmyer (1986), and Kocsis, Marcsik, and Mann (1992).

The work of these individuals focuses on archaeological dental discoveries in addition to modern dental medicine. Schranz has actively pursued projects of identification of individuals through teeth (Schranz, 1953), prehistoric investigation of paradentosis (Schranz, 1962), evaluation of dental wear by dental and culture-historical use of fossil teeth, and dental disease and the appearance of caries in prehistoric peoples (Schranz, 1856, 1964, 1988; Schranz and Huszár, 1954, 1955, 1958, 1962).

K. Tóth has worked on similar projects. His observations on archaeological skeletal materials led to his study of connections between civilization, dental caries, and origins and results of dental pathology. He has also investigated the frequency of caries during the seventh to the thirteenth centuries AD (Tóth, 1966a, 1966b, 1966c, 1967a, 1967b, 1967c, 1967d, 1968, 1970a, 1970b, 1980/81; Tóth and Sonkodi, 1972).

G.S. Kocsis was a student of Tóth at the Medical University in Szeged. He continues to study archaeological skeletal materials. (Kocsis, 1988; Kocsis and Marcsik, 1979, 1980, 1981, 1982, 1983a, 1983b, 1987, 1989; Kocsis and Mari, 1988; Kocsis and Trogmyer, 1986; Kocsis, Marcsik, and Mann, 1992; Marcsik, 1989; Marcsik and Kocsis, 1984, 1985 1986; and Marcsik, Kósa, and Kurucz, 1984).

In addition to these publications, some important studies in clinical dentistry must be mentioned. For example Vajdovich and Dinnyés (1989) have enhanced our knowledge of anatomical and typographic relationships of the mandible through a study which corrected earlier information about the course of the mandibular canal. Pónyi and Szabó (1956), through a study of 38 reference points on 528 historical mandibles, established reference points for the placement of mandibular protheses. In several papers, Prágai and Fazekas (Prágai, 1982; Prágai and Fazekas, 1982, 1983) have reported the results of their investigations of the height of the mandibular spine in the region of molar teeth. Finally, Tóth's (1980/81) report on the frequency of "buck teeth" in Hungary is interesting from an anthropological point of view.

Forensic Dental Anthropology

Forensic medical sections of Hungarian dental anthropology have dealt with important subjects. For example, L. Harsányi (1924-1992) director of the Forensic Medical Institute of Pécs, used scanning electron microscopy to measure morphological changes in cremated teeth (Harsányi, 1977; Harsányi and Nemeskéri, 1962, 1964). By exposing teeth to temperatures ranging from 200° to 1200° C, he could estimate the amount of heat applied through observation of morphological changes in the dentine. As a result, he concluded that teeth from a cremation burial cemetery in Issendorf, Germany, had been exposed to temperatures between 200° and 900° C.

My own work has dealt with forensic osteology for nearly 30 years. Examples of publications are Kósa (1978, 1984, 1989, 1990a, 1990b); Kósa, Szendrényi, and Tóth (1978); Kósa, Ferenczi, and Baláspiri (1985); Kósa and Antal (1988); Kósa, Farcas, and Wittman (1989); and Kósa, Antal, and Farkas (1990).

My first paper, published in 1966, dealt with fetal bones. "Estimation of fetal body length and age on the basis of bone measurements" was the subject of my Candidate's dissertation in 1969, and "Individual and Chronological Age of Human Bones" was the topic of my academic Doctor of Science dissertation in 1990.

My investigation was aimed at the estimation of age and its limits through research carried out with atom absorption spectrophotometry, automatic amino acid analysis, polarization optics, scanning electron microscopy, and electron probe analysis of osteological and dental samples.

I have published 38 papers and delivered approximately 70 scientific lectures in the field of forensic osteology. One of my best known works is the book, *Forensic Fetal Osteology* (Fazekas and Kósa, 1978), which summarizes all the information useful for forensic anthropology, age estimation, and paleoanthropology. Additional publications in books are Clement and Kósa (1989), Kósa (1978, 1989), and Marcsik, Kósa, and Kocsis (1992).

Part of my scientific odontological work has been done with A. Marcsik, first assistant at the Department of Anthropology of Joseph Attila University of Science in Szeged. Another portion is carried out with my co-workers at the Institute and at the Medical University.

My forensic odontological investigations on the estimation of individual age can be summarized as follows: age dependent translucency phenomenon observed on the roots of teeth can determine the age of an individual, in both recent and historical osteological discoveries (Kósa, Szendrényi, and Tóth, 1983). According to our findings, secondary dentine formation generates changes in dimension that show a definite correlation with age (Kósa and Antal, 1988).

Dentine tubules for age estimation have been studied by scanning electron microscope. Results show a significant correlation ($P < 0.01$) between metrics and structure of dentine tubules and age. Therefore, the mean value of dentine tubules provides a good means for estimating individual age (Kósa, 1984). The electron microscope was also used for studying finer dentine structures associated with age. On the teeth of older individuals (over 50) a granular loose structure appears instead of the homogeneous structure of intertubular basic dentine substance. A definite hypermineralization can be seen around the few diminished dentine tubules (Kósa, 1984).

Using atom absorption spectrophotometry, we studied the inorganic content of human teeth and assayed calcium, sodium, potassium, magnesium, iron, zinc, copper, lead, and lithium (Földes et al., 1981). Our results show that the concentration of inorganic elements in teeth is significantly higher than those in bones ($P < 0.05$).

Using electron probe microanalysis, we established that the calcium-potassium weight ratio is higher on the surface of the hypermineralized zone around the dentine tubules than it is in the basic substance between the tubules. Thus, the electron probe microanalysis method offers an excellent means for identifying the age of an individual in dental samples (Kósa, Antal, and Farkas, 1990).

Historical Anthropological Work Team

At the present time, the most intensive dental anthropological research is done in Szeged. The Historical Anthropological Work Team, led by A. Marcsik, has been studying skeletal materials from archaeological excavations. Marcsik defended her Candidate's dissertation in paleoanthropology and paleopathology on "Paleopathology of the Avar Period in the Area between the Danube and Tisza" (Marcsik, 1983).

Another well-known member of the team is G.S. Kocsis, who this year wrote his Candidate's thesis entitled "Developmental Anomalies of the Teeth". Kocsis has studied Avar skeletal materials for a number of years, and has co-authored papers on extra-dental paracoronal formations of tooth enamel (Kocsis and Marcsik, 1980), abnormal dental enamel (Kocsis and Marcsik, 1981), and tooth position disorders on Avar teeth (Kocsis and Marcsik, 1982).

I have also worked with the team to solve specific research problems. Professor Michael Finnegan from Kansas State University has worked with us on several projects. Among these are studies of the relationships of Avar Period skeletal materials in Hungary (Finnegan and Marcsik, 1978) and Stafne defect in archaeological and recent samples (Finnegan and Marcsik (1980, 1981).

Our work has also dealt with the etiology of dental enamel disorders, invagination of the coronary end (Kocsis and Marcsik, 1987), frequency of double-rooted *dens caninuses*, and frequency of dental developmental disorders (Marcsik and Baglyas, 1987). We have also described and analyzed paleoanthropological discoveries (Marcsik, 1976, 1983, 1989; Marcsik, Kocsis, and Kurucz, 1984; Marcsik and Kocsis, 1984, 1985, 1986, 1992; Marcsik and Baglyas, 1987; and Marcsik, Kósa, and Kocsis, 1992).

Members of the Historical Anthropological Work team are also studying the prevalence of a developmental disorder of the head of the mandibular joint (*condyilus bifidus)* and disorders of Avar period skulls (Szentpëtery, Kocsis, and Marcsik, 1990). The work team has also published information on the anomaly of "adventitious roots" of maxillary central incisors (Kocsis and Marcsik, 1989), morphological properties, and simultaneous occurrence of porotic hyperostosis, dental enamel hypoplasia, and Harris lines in a collection of eighth to tenth century skeletons (Marcsik, 1989). The teeth in this collection have also been studied for *dens invaginate* and *palatolingualis grave* as a secondary pathosis. These these data have then been compared with teeth from the Neolithic Era to the Middle Ages (Kocsis and Marcsik, 1991). The same authors have also published a paper on the phenomenon of an unidentified "cavity" in bones" on the surface of the posterior part of the mandible (Kocsis, Marcsik, and Mann, 1992).

Recently, the team was invited to write an article on developmental enamel disorders and the occurrence of enamel hypoplasia in prehistoric and historic Hungarians (Marcsik and Kocsis, 1992). We have also written an article based on our paper at the Eighth International Congress on Dental Morphology. The subject is age determination through the transparency of teeth based on a study of historical archaeological materials (Marcsik, Kósa, and Kocsis, 1992).

At the present time, A. Marcsik, G.S. Kocsis, and F. Kósa are the only active Hungarian specialists who are members of the Dental Anthropology Association.

Author's Note

My task, on behalf of the editorial board of the *Dental Anthropology Newsletter* has been to describe the recent scientific tendencies of dental anthropology in Hungary and to introduce prominent representations of the sciences and the latest results in the frame of a short historical review. I hope that anyone that I have omitted will not be offended, as the limits available permitted mention of the most well known scientists contributing to the growth and development of anthropology in Hungary. In addition, Hungarian-language references have been translated into English.

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The Frequency of Two Developmental Anomalies in Osteoarchaeological Samples

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The literature on developmental anomalies of the teeth contains a multiplicity of classifications. The most widely accepted is Schulze's (1970) classification of anomalies of tooth size and shape, structure, position, occlusion, supernumerary teeth, twin formation, and absence of teeth. The palato-gingival groove and *dens invaginatus* are two of Schulze's shape and size developmental disorders.

Developmental anomalies of teeth occur in varying frequencies in prehistoric and historic populations. The primary purpose of our investigation was to examine the prevalence of palato-gingival groove and *dens invaginatus* in osteoarchaeological samples.

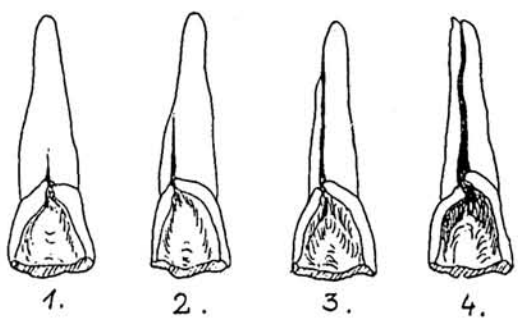
The palato-gingival groove occurs most often on the maxillary lateral incisors. However, the anterior teeth may also be affected (Winters et al., 1981). The palato-gingival groove originates in the central fossa area, crosses over the cingulum, and continues apically down the root for varying lengths (Simon et al., 1971). The feature can be classified by length (Fig. 1) and by depth.

The cause of the groove is unknown. Mechanical effects on the tooth germ may be responsible for the groove, as well as for dental invagination (Lee et al., 1968). The palato-gingival groove is considered to be a form of invagination (Walker and Glyn Jones, 1983). Fusion of the teeth may also cause malformation, as in the case of *dens invaginatus* (Bruszt, 1950).

Dens invaginatus, invaginated odontoma, or *dens in dente*, is a developmental anomaly, which results from invagination of the tooth germ prior to calcification. This anomaly is most frequent in the maxillary incisors (Aboyans and Ghaemmaghami, 1976).

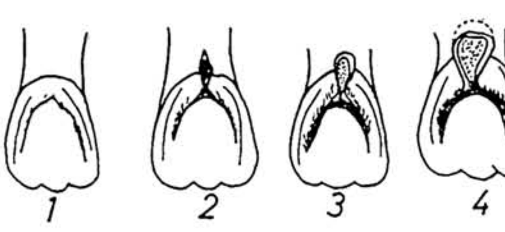
Dens invaginatus occurs in two forms: coronal and radicular. Coronal invagination is subdivided into superficial and deep cases (Schulze, 1970). Hallett's (1953) four part classification is the most widely accepted (Fig. 2). Another classification is that of Parnell and Wilcox (1978), which distinguishes minor, deep, and dilated forms.

The pathogenesis of coronal invagination is not entirely known. It may be formed by union of adjacent teeth, a single active proliferation, or passive retardation of a circumscribed area of epithelium (Schulze, 1970). Grahnén et al., (1959) have also suggested that *dens invaginatus* is genetically determined.



1. Groove is into the enamel-cementum junction.
2. Groove extends over half of the root.
3. Groove extends to the apical region of the root.
4. Groove extends to the apex of the root (bifid root).

Fig. 1. Types of palato-gingival groove (according to expansion of the groove).



1. Definite cleft is formed in the palatal enamel at the cervical level.
2. Invagination extends toward the pulp chamber, and a definite pit is formed in the cingulum.
3. Invagination extends deeply into the pulp chamber and is dilated.
4. The invagination apparently includes the entire coronal pulp chamber, and may extend beyond the enamel-cementum junction level.

Fig. 2. Types of invagination (Hallett, 1953)

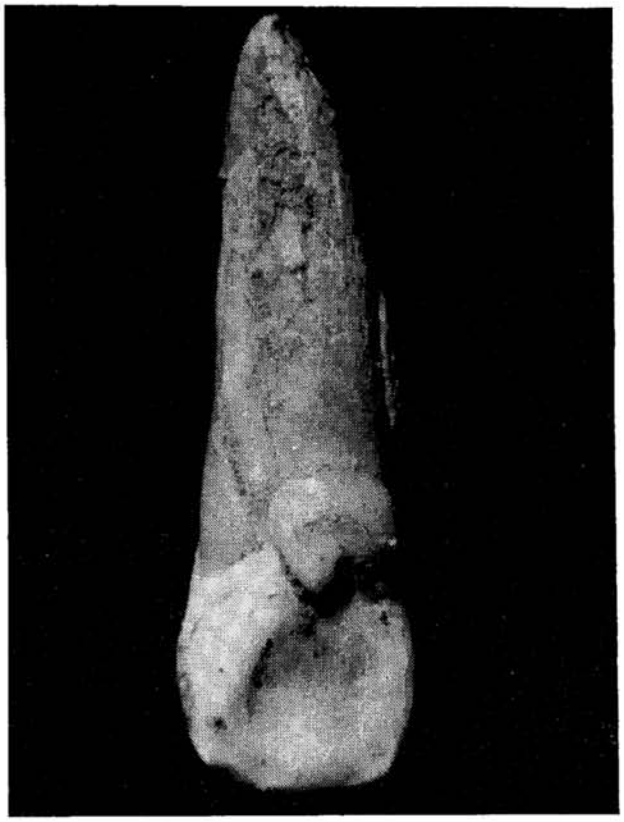


Fig. 3. Palato-gingival groove (type 2) from the site of Sárrétudvari, 10th century.

Fig. 4. *Dens invaginatus* (type 3) from the site of Szarvas, 8th century.

MATERIALS AND METHODS

Specimens dating from the Neolithic Era to the 18th century, curated in the Department of Anthropology, József Attila University, Szeged, Hungary, were used in the study. The sample examined for palato-gingival groove consisted of 1,997 specimens (skulls and individual maxillae and mandibles) with 13,708 permanent anterior teeth. Of these, 1,765 specimens with 6,183 permanent anterior teeth were examined for *dens invaginatus*. Methods used for the study of the two anomalies were direct observation and examination of X-rays.

RESULTS AND DISCUSSION

The incidence of palato-gingival groove was 12.42%, and that of *dens invaginatus*, 4.31% per individual. However, we found no tendency in the frequency of either feature from the Neolithic to the 18th century (Tables 2 and 3).

Maxillary lateral incisors most frequently contained coronal invagination (5.24%) and palato-gingival groove (10.22%) (Table 3). *Dens invaginatus* was not observed on the canines. Palato-gingival groove was found in one mandibular lateral incisor and one maxillary canine. Similar frequencies in archaeological samples have been reported by Brabant and Sahly (1962), Brabant (1969), and Kocsis and Marcsik (1983, 1991).

The majority of palato-gingival grooves were classified as types 1 and 2 according to their extension (Fig. 3). Forty-two teeth contained the maximum groove which extended to the apex of the root. Grooves on central incisors generally occurred mesially, and those on lateral incisors, distally. Through study of X-rays, we found Hallett's type 3 dilated form of invagination (Fig. 4) in 40 specimens (54 lateral incisors or 2.72%). Hallett's type 2 was found in 30 specimens (44 lateral incisors or 2.22%).

TABLE 1. Frequency of palato-gingival groove in archaeological periods (all anterior teeth)

Archaeological Period	Number of Specimens	Specimens with Groove		Number of Teeth	Teeth with Groove	
		Number	Percent		Number	Percent
Neolithic	99	11	11.11	600	12	2.0
Copper Age	278	20	7.19	1,602	22	1.37
Bronze Age	238	39	16.39	1,829	44	2.41
Iron Age	202	22	10.9	1,444	25	1.73
2nd—5th Centuries	222	23	10.36	1,487	30	2.02
7th—8th Centuries	241	38	15.77	1,965	44	2.24
10th—11th Centuries	231	39	16.88	1,705	44	2.58
12th—13th Centuries	217	29	13.36	1,509	34	2.25
14th—18th Centuries	269	27	10.04	1,567	40	2.55
Total	1997	248	12.42	13,708	295	2.15

TABLE 2. Frequency of dens invaginatus in archaeological periods (maxillary anterior teeth)

Archaeological Period	Number of Specimens	Specimens with *dens*		Number of Teeth	Teeth with *dens*	
		Number	Percent		Number	Percent
Neolithic	77	4	5.19	247	5	2.02
Copper Age	228	7	3.07	687	10	1.46
Bronze Age	222	14	6.31	882	22	2.49
Iron Age	175	4	2.29	647	6	0.93
2nd—5th Centuries	197	6	3.05	694	8	1.15
7th—8th Centuries	227	17	7.49	834	23	2.76
10th—11th Centuries	215	8	3.72	787	12	1.52
12th—13th Centuries	191	4	2.09	715	5	0.70
14th—18th Centuries	233	12	5.15	690	19	2.75
Total	1,765	76	4.31	6,138	110	1.78

TABLE 3. Frequency of palato-gingival groove and dens invaginatus according to tooth types

Tooth Type	Palato-Gingival Groove			*dens invaginatus*		
	Number teeth	Number with Groove	Percent with Groove	Number with *dens*	Number with *dens*	Percent with *dens*
Maxillary central incisors	1,908	85	4.45	1,848	6	0.32
Maxillary lateral incisors	2,036	208	10.22	1,983	104	5.24

With regard to symmetry-asymmetry relationships, we were able to study only those skulls with both central and/or both lateral incisors. Our results showed that *dens invaginatus* was present more often bilaterally, whereas the palato-gingival groove was more frequently asymmetric. These results are similar to those reported by Withers et al. (1982).

Several studies (Lee et al., 1968; Everett and Kramer, 1972; and Walker and Glyn Jones, 1983) have shown that palato-gingival groove is associated with *dens invaginatus*. In our sample, invagination occurred together with the groove in nine out of 104 teeth (8.65%).

Different invaginations may be accessory factors in the formation of dental caries. The palato-gingival groove is also the frequent site of caries, and sometimes causes periapical pathosis (Aboyans and Ghaemmaghami, 1976). Based on clinical reports, localized bone lesions in paleoanthropological material may have been caused by the palato-gingival groove and/or *dens invaginatus*.

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Digital Radiography for the Quantification of Alveolar Bone Loss in Studies of Periodontal Disease Variation

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It has been hypothesized that differing human groups show varying patterns of periodontal disease. To test this hypothesis, accurate and reproducible measures of periodontal disease must be used. One method for achieving this end is through the use of digital radiography. Once the distribution of periodontal disease is known, it will be possible to make suggestions concerning possible etiologic agents. In this paper, we present a short review of periodontal disease epidemiology and our experience with digital radiographic methods for the quantification of periodontal disease.

The largest and most comprehensive dental survey ever undertaken was recently conducted by the National Institute of Dental Research (The National Survey of Oral Health of U.S. Employed Adults and Seniors: 1985-1986). In this study, 20,000 adults representing 104 million people were examined. This survey was a repeat of one conducted in 1979-1980. Although periodontal health had improved since the earlier time period, 42% of those over the age of 65 were toothless. Those who retained teeth had more severe and advanced periodontal diseases than did younger adults. It was concluded that "periodontal diseases remain widespread in America" (Broadening the scope: Long-range research plan for the nineties: National Institute of Dental Research, NIDR).

The actual cause or causes of periodontal disease are not well understood. Bacteria in dental plaque are generally thought to be major contributors, but whether a genetic or environmental component contributes to increased host susceptibility or whether particularly virulent strains of bacteria cause rapid disease progression is unknown. Findings that the rate of periodontal disease differs among individuals has lead to the suggestion that periodontal bone loss does not occur at equal rates throughout the population and that the highest prevalences of loss may occur in specific ethnic, geographic, and socio-economic groups (Bailit and Manning, 1988; Baelum et al., 1988; Albandar, 1990). The identification of these groups highlights an important area for future research; however, the identification of putative high-risk groups requires a suitable method that can be used to quantify periodontal disease. The development of such a method has proven to be a challenging problem (Hildebolt and Molnar, 1991).

CLINICAL METHODS FOR STUDYING PERIODONTAL DISEASE

Clinical evaluations of periodontal disease are based predominantly on probing depths, a soft tissue measurement that is made with a hand-held periodontal probe. For example, the presence of a periodontal pocket is considered to be pathognomonic of past adult periodontal disease activity and indicates cumulative damage to the junctional and sulcular epithelium, with concomitant apical migration of the junctional epithelium and destruction of the periodontal ligament and alveolar bone (Barrington and Nevins, 1990; Greenstein and Caton, 1990). A more time-consuming measurement is gingival attachment level (AL). The measurement of AL (usually made from the cementoenamel junction) is the most commonly used measurement of past disease activity in clinical trials (Caton, 1989; Greenstein and Caton, 1990; Lang and Bragger, 1991). It is important that such trials be conducted over an extended period of time to assure that measurements represent true changes in attachment level and not merely changes due to localized gingivitis (Greenstein and Caton, 1990). The inherent problems associated with making such evaluations with a standard manual probe (for instance measurement accuracy and repeatability) are well known (Jeffcoat, 1991; Hildebolt and Molnar, 1991).

Another commonly used method for measurement of periodontal disease is the quantification of alveolar bone with dental radiographs. The ultimate sequela of periodontal disease is advanced alveolar bone resorption and related tooth loss. Digital radiography has the potential to identify bone resorption before it is clinically detectable and thus aid diagnosis and treatment. In the past, however, the quantification of alveolar bone loss from dental radiographs was cumbersome, and therefore radiographic methods were not widely used. Recent advances in digital imaging technology have provided new possibilities for improving the diagnostic capabilities of dental radiology.

DIGITAL IMAGING OF DENTAL RADIOGRAPHS

Digital imaging of dental radiographs requires a computer and a digitizing system (Fig. 1). In the last few years competition in the market place has reduced the price of both digitizers and computers, making digital radiography available to an increasing number of researchers. These methods are practical and have a high degree of accuracy and reproducibility. Since 1986 our laboratories have focused on the use of digital radiography to quantify alveolar bone and other dental features in living and extinct, human and nonhuman primate populations.

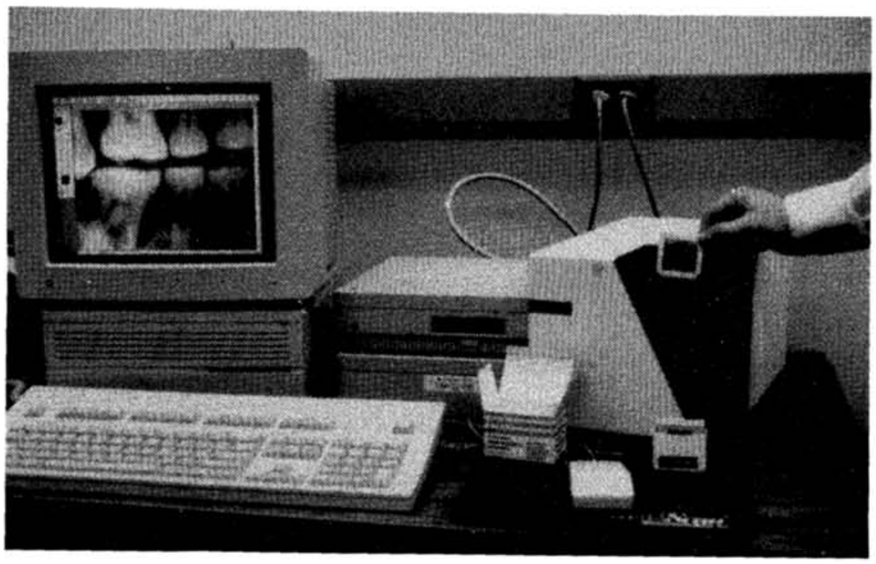

Fig. 1 Macintosh™ personal computer, disk drive, and Barneyscan™ slide scanner used for digital image processing.

In our studies, we have had the most experience with the Apple Macintosh™ (an adequate LC starts at about $1,500). Therefore, most of our comments concerning image processing (working with the digital image) apply to this computer, although similar comments would undoubtedly apply to IBM PC (and compatibles) 486/25 (or faster) machines.

The digitization process involves converting an analogue radiographic image to a discrete (digital) form. This is done by dividing the image into individual pieces of information called pixels (picture elements). Each pixel contains information on its location within the image and its shade of gray (running from black to white). There are two fundamental techniques used to convert radiographs to digital images: video systems and scanner systems.

Most quantitative periodontal disease data can be obtained using digitizers with a price tag of $20,000 or less (that is, little additional data can be obtained with more expensive digitizers). Moreover, because of the fortuitous circumstance that dental radiographs are nearly the same size as 35-mm slide film, dental radiographs can readily be digitized with 35-mm slide scanners, for which there has been considerable competition among manufacturers. We have had experience with two slide scanners: the Barneyscan (Barneyscan Corporation, Berkeley, CA, $3,500) and the Nikon (Nikon Electronic Imaging, Melville, NY, $8,700). Both have proven adequate for dental radiographic imaging, although it is our experience that the

Nikon is better able to record brightness variations on dental radiographs. For high resolution (12-bit, see next paragraph) radiometric measurements we are currently using the Molecular Dynamics Personal Densitometer (Sunnyvale, CA, $20,000).

Digital image quality is directly affected by two factors, contrast resolution and spatial resolution. Contrast resolution is determined by the number of gray scale values into which an image is divided. Most dental investigators use 256 (8-bit) levels of gray. Spatial resolution can be thought of as the number of pixels into which the radiographic image is divided. The most commonly used spatial resolution for dental imaging is 512 x 512. We are currently evaluating 12-bit resolution (4096 gray levels) and spatial resolution requirements for periodontal disease imaging (Hildebolt, Brundsen et al., 1993).

Because of the rapidity with which this technology is evolving, it is important that care be taken to ensure that the digitizer one purchases is appropriate for the questions being asked. For example, some digitizers do not have a linear response to variations in radiodensities (radiographic brightness). This may present problems if radiodensity measures are of interest in analyses. There are a number of easily performed tests that can be used to evaluate digitizer performance (Hildebolt et al., 1990a). The tests require only readily available test patterns and a hand held digital densitometer (which is available in most radiology departments or can be purchased for about $700). As a bare minimum, one should digitize several radiographs, representing a spectrum of exposures from light to dark. As a rule of thumb, if the digitized image does not look the same as the original radiograph, it is likely that it will not lend itself well to quantitative measurement.

DATA COLLECTION

For making measurements, we use the Image software package written by Wayne Rasband (Research Services Branch, National Institute of Mental Health, Bethesda, MD). Image is a public domain program that can be freely copied and is available through numerous user groups and Internet (ALW.NIH.GOV) or can be purchased for $100 from the National Technical Information Service (NTIS, telephone: 703-487-4650). We evaluated Image and three other image analysis programs and found Image to be the most comprehensive for the quantitative measurement of alveolar bone loss (Hildebolt, Vannier et al., 1992).

Two types of data can be collected from digital images of dental x-rays: geometric and radiometric. To document bone loss, linear measures are typically made from the cementoenamel junction to the alveolar crest. There is general agreement among researchers that this measure represents alveolar bone loss and that differences in geometric measures through time are due to changes in the profile of the alveolar ridge (for a different opinion see Clarke and Hirsch, 1991).

ADVANTAGES OF DIGITAL IMAGES

Geometric measures are well suited for cross sectional studies in which average bone loss for two groups is being contrasted. These measures have been shown to have a high degree of accuracy and repeatability with both dry skulls and patients (Hildebolt, Vannier, Schrout, Province et al., 1990; Hildebolt, Vannier, Shrout, and Province, 1990). To detect a difference in bone loss of 0.4 mm (a difference that we feel is biologically meaningful) between two age matched groups, statistical significance can be achieved with a sample size as small as 25 individuals (Hildebolt, Vannier, and Shrout, 1993). Such sample sizes are readily available in patient groups and osteological collections.

Another advantage of digital radiography for making geometric measures, is that it is not necessary to make bone loss measurements of all teeth to obtain a good estimate of bone loss patterns. Our research indicates that bone loss measurements for the mandibular second premolars accounts for 84% of full-mouth variation, and 87 to 92% can be accounted for if an additional posterior tooth (excluding 3rd molars) is included (Shrout et al., 1990). Thus, two vertical bitewing radiographs (one for each side of the mouth) would be adequate for most surveys. Moreover, instead of a traditional 16-film full radiographic series, a 7-film vertical bitewing survey allows measurement of bone loss patterns to be made of all teeth, with a concomitant reduction in exposure to ionizing radiation (Shrout, 1991).

Radiometric measures of digitized dental x-rays provide a representation of alveolar bone density. It seems likely that changes in the density of the alveolar bone occur before there are actually changes in bony profile of the ridges. Radiometric measures are, therefore, ideal for longitudinal studies. Before performing such measures, however, variations in exposures among films should be corrected (Ruttimann et al., 1986).

There is evidence that radiometric data can be used to semiautomatically classify the health of alveolar bone (Hildebolt, Zerbolio et al., 1992). Radiometric methods have also recently been used to show that there may be an interrelationship between bone mineral content in the alveolar processes and in the postcranial skeleton of some postmenopausal osteoporotic women (Hildebolt, Rupich et al., 1993).

Digital subtraction radiography has also been applied to the measurement of alveolar bone loss (Braegger, 1988). With these methods, one image is subtracted from another to determine bone changes. We do not, however, recommend this method, as both images have to be exactly superimposed to obtain quantifiable results. Digital radiographic techniques also have considerable potential for collecting data on other aspects of dental morphology. For example dental features such as dentine and enamel thickness can be assessed noninvasively in both living and fossil subjects. Recently we have applied these methods to the quantification of Neanderthal dental morphology (Molnar et al., 1993). This appears to be an important growth area for dental anthropology.

SUMMARY

In sum, practical and affordable digital radiographic methods exist for making accurate and reproducible quantitative measures of alveolar bone loss in comparative studies of periodontal disease variation. We have even used these methods in a demanding field environment to study the periodontal health of baboons (Hildebolt, Phillips-Conroy et al., 1993). These methods offer a means of establishing the distributions of periodontal disease. Once this is accomplished, potential etiologic agents can be suggested.

AUTHORS' NOTE

In the last issue of DAN [Clarke N (1993) Periodontitis in dry skulls. 7 (2):1-4], it was stated that "since the mid-eighties it has become evident that at the present time periodontitis is neither an all-embracing disease nor an important cause of tooth loss." In this article, we present a different but more widely held view. Additional research is required to resolve this issue.

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Book Review

RECENT CONTRIBUTIONS TO THE STUDY OF ENAMEL DEVELOPMENTAL DEFECTS. Edited by Alan H. Goodman and Luigi L. Capasso. Chieti (Italy): Journal of Paleopathology, Monographic Publication 2. 1992. 400 pp. 150,000 lira (approximately $95.00) (paper).

The study of enamel hypoplasia (EH) and other enamel defects has been, and continues to be, a common method for estimating environmental stress within prehistoric and recent populations in both physical anthropological and dental clinical fields. *Recent Contributions to the Study of Enamel Developmental Defects* will be of interest to workers in both fields. The volume contains 29 articles (plus introduction) divided among three broad categories: (1) Fundamental Issues and Methodological Contributions, (2) Application to Studying Past Human Populations, and (3) Reviews and Applications to Studying Contemporary Human Populations. With 55 contributors from the US, Canada, Mexico, Europe, India, Hong Kong, Japan, Australia, and New Zealand, this book truly represents a broad-ranging international contribution to the study.

Section 1 contains nine articles. Berti and Mahaney attempt to determine confidence intervals in the estimation of the age at which hypoplastic defects occur; and they discuss different methods of age determination. Sciulli presents a new method for aging EH defects in deciduous mandibular teeth, noting that older methods may not be reliable. Skinner discusses the neonatal line and its formation; he relates that it occurs nearer to the occlusal surface in pre-term infants. Danforth and Giliberti present an assessment of inter- and intraobserver concordance—an aspect of enamel developmental defect study which has seldom been evaluated. Condon and Rose find some differences in EH defects within and between tooth types, but overall observe a great deal of similarity. They note that linear defects between teeth can be matched in the same manner as dendrochronology, allowing a record of stress throughout childhood. Marks reports similar findings utilizing SEM analysis. Capasso and Di Tota discuss the possibility that the lower molar buccal pit is actually an enamel developmental defect as opposed to a morphological variant. Eckhardt et al. describe vertical EH, a rare enamel defect, in Liberian chimpanzees. And, Goodman et al. state that surface and histological defects in the permanent canines of prehistoric Black Mesa, Arizona individuals suggest chronic stress.

Section 2 contains 10 articles. Mack and Coppa look at EH in 5000 year-old Arabian Peninsula hunter/gatherers; over 98% of the individuals exhibited at least one hypoplasia. Mittler et al. find a positive association between EH and cribra orbitalia in a study of Medieval Nubian sub-adult mortality. Larsen and Hutchinson find a decrease in hypoplasia from prehistoric through European Mission period times in Florida Native Americans, an apparent contradictory finding compared to several other stress indicator studies. Storey discusses enamel opacities and other better known enamel defects in deciduous teeth, whereas Whittington studies chronic and acute EH in permanent teeth from a Classic Maya sample. Ubelaker records EH in 15 samples, spanning 8000 years in coastal and highland Ecuador. He describes evidence for maternal stress in more recent samples based on defects in deciduous teeth. Marcsik and Kocsis observe a variety of enamel defects in prehistoric and historic samples from Hungary, and relate that the overall incidence of EH is low. Yamamoto notes variation in hypoplastic defects from Jomon through modern times in Japan. Kuhl looks at six cremated Bronze and pre-Roman Iron Age children, and records EH, Harris lines, and cribra orbitalia. And, Hall and Bowman study 12 dentitions from 18th-19th century children interred in a London Church, observing evidence of rickets and a 41% incidence of EH.

Section 3 contains 10 articles. Suga presents a histological and radiographic analysis of rat, monkey, and human tooth enamel for hypoplasia and hypomineralization. He recommends internal analysis of enamel in prehistoric studies as the most complete methodology. Eckhardt lists linear EH frequencies in the same Liberian chimpanzee sample noted above. He concludes that EH occurrences are "population-specific manifestations of a general facultative response that is part of our primate heritage." Duray studies the relationship between enamel developmental defects and dental caries in an 800-1100 AD sample from the Libben site; he finds a positive correlation between demarcated enamel opacities (hypocalcification) and caries, but a negative correlation between enamel hypoplasia and caries. Seow uses EH occurrence in deciduous teeth to discern perinatal and neonatal morbidity, and concludes that the prevalence of such defects shows a direct relationship to birth weight. King and Tsang describe tetracycline discoloration in the enamel and dentine of Chinese deciduous teeth. They find that some staining is apparent only under ultra-violet light. King and Wei provide a literature review of enamel defects in permanent teeth of modern humans. They also find a positive correlation between fluoride levels in the water and the number of enamel opacities. Lukacs and Joshi study three plaster cast samples from living northwest Indians (India), and find a 68-87.7% incidence of EH. Goodman et al. observe a negative association between linear EH and socioeconomic status, height-for-age, and weight-for-age in 296 modern Mexican children. They posit that their study will help in the understanding of the same factors in prehistoric samples. Hillier and Craig find systemic disease is associated with a greater number of prominent striae of Retzius in deciduous teeth of living British children. And, Suckling et al. use scanning proton microprobe analytical techniques to measure the levels of fluoride in human enamel and dnentine before and after the introduction of fluoride in drinking water and toothpaste. The later sample's teeth contain higher amounts of fluoride.

Overall, the book represents a solid effort to consolidate the most recent and topical aspects of enamel developmental defect analysis. The editors are to be congratulated for assembling such a wide variety of articles on the topic. The book is appealing and professional in its appearance, and is well-illustrated (170, 31 in color). The first section is quite informative. All nine articles are well-written and interesting. I personally enjoyed the papers by Danforth and Giliberti, Condon and Rose, and Goodman et al. The 10 articles in the third section are equally well done. I found the studies by Duray, Seow, and Lukacs and Joshi to be of special interest. The second section begins strongly. Papers by Mittler et al, Larsen and Hutchinson, and Ubelaker are exceptional.

However, the last four articles in Section 2 are somewhat uneven in their content. The Marcsik and Kocsis study is nicely illustrated, and covers a wide variety of interesting defects. Yet, it could have been better organized and more tightly focused. Yamamoto's attempt to discern EH secular trends is interesting, but findings based on just four samples from a roughly 10,000 year span are questionable. The Kuhl study may be overly-detailed (15 text pages) for most readers, especially considering the small sample size (n=6) which consists of cremated individuals. And, Hall and Bowman's paper may also be too detailed for a sample consisting of 12 individuals. In addition, the first three of these articles are hindered by grammatical problems (e.g. one sentence paragraphs, syntax errors, incorrect spelling, etc.), which may contribute to their apparent organizational shortcomings. Such errors probably result from the use of English as a second language. These kinds of errors are understandable, but they should have been noted by the proofreaders and editorial staff.

Similar errors occur elsewhere in the book. There are a variety of misspellings, grammatical problems, and inconsistencies which are distracting. For example, Capasso and Di Tota's paper alternately cites the same reference as Miller 1889, 1898, and 1989; in Marcsik and Kocsis' article, a photograph is printed upside down and backwards; and one contributor's name is spelled two ways: Bowman vs. Browman. However, it may be possible that some of these problems occurred during typesetting, and were thus beyond the editors' control.

In spite of these few distractions, the book will provide a valuable addition to the library of all workers interested in the study of dental pathology. Nowhere else will one locate a single source presenting such a comprehensive compilation of recent diverse studies on the topic of enamel developmental defects.

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DENTAL RESEARCH NEWS FROM SOUTH AFRICA

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Professor Julius Kieser, of the Department of Oral Pathology, is working with Dr. Francis Thackeray of the Transvaal Museum, Pretoria, on the shape of the dental arcade of *Homo sapiens* from the late Pleistocene to the present. Kieser and Dr. H. Groeneveld are also studying the effects of maternal alcohol consumption on odontogenesis.

Dr. M. Steyn is evaluating dental caries and enamel hypoplasia in protohistoric skeletal material from Mapungubwe, in the northern Transvaal. Dr. Steyn is a Ph.D. student in the Department of Anatomy and Human Biology.

Dr. Jacopo Moggi-Cecchi, a former J.J. Smieszek Fellow in my Palaeoanthropology Research Unit, and myself are working on the dental arcades and the state of odontogenesis in a juvenile australopithecine recently excavated from the Sterkfontein cave deposit. My long, continued excavation at this site has now reached its 27th year.

Finally, Mr. Lee Berger, one of my Ph.D. students, discovered two early hominid teeth at Gladysvale last year. This well-known fossil site is not far from Sterkfontein. Although the site had been excavated intermittently for over 50 years, this was the first occasion on which hominid remains were found in the cave deposits. This makes it the first new early hominid-bearing site discovered in South Africa since 1948.

NEWS FROM JAPAN

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I am happy to announce that I retired from the International Center for Japanese Studies on March 31, 1993. I am now working at the International Institute for Advanced Studies (IIAS) as the chairperson of the Planning Board.

IIAS covers every field of sciences and will be formally opened on October 1, 1993, in Kyoto. The purpose is the creation and development of new supradisciplinary sciences that can deal with current and future problems, In this regard, I am working hard to prepare several academic and social activities related to the opening ceremony. As I am teaching at a private university, I have become busier than I was before I retired.

In the meantime, I am still working at the International Research Center for Japanese Studies (IRCJS) at least twice a week. I have been appointed Professor Emeritus at IRCJS and at the University of Tokyo.

Minutes of the Eighth Annual Meeting of the Dental Anthropology Association

Toronto, Ontario, Canada April 16, 1993
M.Y. Iscan presiding for S. Molnar

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

A. Status of the Treasury: As of April 16, 1993, the Association's net assets are $1,165.83. Each DAN issue costs roughly $425.00 for publication and foreign postage. 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 (May and October), and part of a third (January 1994).

B. Membership Status: As of April 16, 1993, the DAA has 313 members — up 67 from one year ago. We would have had 323 members, but 10 non-paying members were dropped. They did not answer our letters requesting payment nor did they request sponsorship. 205 (65%) members are from the U.S., and 108 (35%) are from one of 25 foreign countries. Only 175 (56%) members are paid up through 1993; 138 (44%) members are delinquent. DAA members are urged to pay their dues; and are also encouraged to donate to our 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, please check your May Newsletter mailing label to determine your status; if "(***)" appears behind your name, please remit $10.00 for Regular Membership, $5.00 for Student Membership, or request Sponsored Membership from the Secretary-Treasurer. Payment in U.S. funds is preferred, but an equivalent amount in foreign funds is acceptable.

II. REPORT OF THE NEWSLETTER EDITORS (Sue Haeussler):

A. Acknowledgement: Sue Haeussler thanked all who had submitted articles during the past year. She especially acknowledged Diane Hawkey, Joel Irish, Christy Turner, Loring Brace, Daris Swindler, John Lukacs, and Albert Dahlberg for their editorial work and advice.

B. Submission of Articles: Members are requested to send news briefs and short articles for inclusion in the Newsletter.

C. Newsletter Improvements: Members in attendance at the business meeting were asked for suggestions on improving the Newsletter. J. Calcagno (Chicago-Loyola) responded by saying that "the Newsletter is getting better and better each year."

III. REPORT OF THE EXECUTIVE BOARD (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: Executive Board Member, Linda Winkler, will explore the possibility that future DAA Business Meetings 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).

IV. OLD BUSINESS

No Old Business.

V. NEW BUSINESS:

A. Nominations for 1994 Elections: Nominations should be sent to Linda Winkler, Executive Board Member from the University of Pittsburgh at Titusville, for three positions in the 1994 elections: 1) DAA President (2 years), 2) DAA Newsletter Editor (4 years), and 3) the proposed new DAA President-Elect (see below).

B. Proposed New DAA Position: President-Elect: 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, DAN Editor, and Executive Board Member.

In order to allow the creation of this new position, the current by-laws need to be changed to allow the inclusion of President-Elect. Linda Winkler made a motion to bring to a vote at next year's meeting, a change in the by-laws which would allow the creation of the President-Elect position. C.L. Brace (Michigan) seconded the motion. The motion passed by a 2/3 majority vote of the members present. Thus, this measure will be voted on in April 1994 at the 9th Annual Meeting of the Dental Anthropology Association, in Denver, Colorado.

C. AAPA/DAA Symposia: M.Y. Iscan noted that the DAA was not credited as being a co-sponsor of the two Dental Anthropology Sessions in Toronto, and should have been. The DAA has sponsored many such sessions in the past. Linda Winkler (Executive Board Member) mentioned that she had notified the AAPA Program Chair regarding this matter, but the Association was still inadvertently left off the AAPA program. Dr. Winkler stresses that individuals considering forming dental symposia for the 1994 AAPA meeting let her know well ahead of time so she can inform the AAPA 1994 Program Chair. C.L. Brace stated that the DAA Executive Board should coordinate to keep track of upcoming symposia. Sue Haeussler suggested that possible 1994 dental symposium information be sent to the Newsletter for dissemination.

Minutes prepared by Joel D. Irish
Submitted April 23, 1993.

Recent Publications

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DAA MEMBER DISSERTATION

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JOURNAL NAME CHANGE

Beginning with Volume 101, the *Journal of the Anthropological Society of Nippon* is *Anthropological Science*.

Compiled by A.M. Haeussler

The Dental Anthropology Newsletter

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