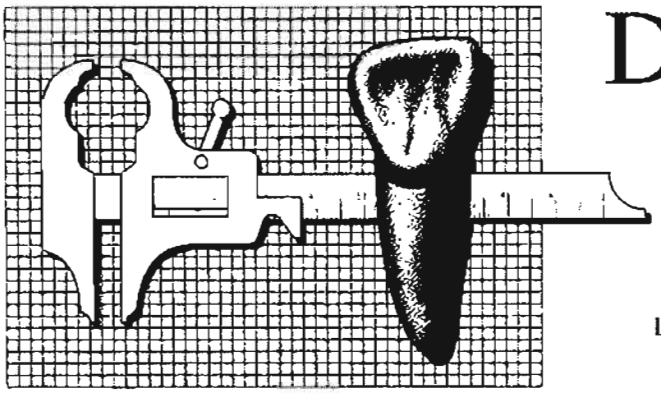

Dental Anthropology Newsletter

A PUBLICATION OF
THE DENTAL ANTHROPOLOGY ASSOCIATION

Laboratory of Dental Anthropology Department of Anthropology
Arizona State University Tempe, AZ 85287-2402

Volume 6, Number 2 **January, 1992**

Dental Anthropology in South Australia

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Adelaide, the capital city of South Australia, has long been recognized as an important center of physical anthropology in Australia. Although there was no formal establishment of physical anthropology as a discipline within the University of Adelaide, substantial contributions were made by professionals from other fields, particularly medicine and dentistry. Naturally, dental anthropology and related aspects of craniofacial biology have provided a focus for some academic dentists of South Australia.

The unique position of Adelaide with respect to anthropological studies can be traced to the early history of the State. After a series of explorations of the southern coast and coastal regions, South Australia was proclaimed a province in 1836. Early contact with the coastal Aboriginal people was augmented by a series of inland explorations aimed at finding permanent waters and fertile grazing land. Many of these originated in Adelaide. The principal explorers of the times were Edward John Eyre (1841), Charles Sturt (1844) and John McDouall Stuart (1860). Their expeditions were often marked by tragedy and extreme hardship but they brought stories of the Aboriginals to the notice of the scientists of the early colony.

William Ramsay Smith was one of the earliest to show a scientific interest in anthropology. He was a physician and anatomist, born in Scotland in 1859, and appointed to the Adelaide Hospital in 1896. A colorful character, who played a leading role in public health, pathology and teaching, Ramsay Smith published extensively on anthropological topics. His works included several publications on dental anthropology and an unpublished manuscript titled "Studies in Odontology". As a matter of some interest, Ramsay Smith

bequeathed a collection of 150,000 teeth to the dental school in Adelaide. This collection was recently recovered but is no longer complete.

The most prominent South Australian dental anthropologist was no doubt Thomas Draper Campbell (1893-1967). Campbell was a man of great talent and enormous energy who excelled in a number of fields, particularly dentistry and anthropology. His interest in anthropology was stimulated by Frederick Wood Jones, Professor of Anatomy at Adelaide University 1919-1926. Together Campbell and Wood Jones undertook expeditions to remote parts of the State in the 1920s and their liaison led to the establishment of the Board of Anthropological Research in 1926. The Board sponsored a number of field expeditions between 1925 and 1939 and it was in this period that both anthropology and its dental branch became firmly established in Adelaide. Campbell published extensively throughout his adult life on topics ranging from physical anthropology, dental anthropology, clinical dentistry and ethnology. His best known work is "Dentition and Palate of the Australian Aboriginal" (Adelaide, 1925), one of the earliest monographs in this field. He was, incidentally, a talented musician and composer who had an operetta staged in Adelaide in 1932.

One of Campbell's students, Murray James Barrett (1916-1975) who like Campbell was a dentist by training, deserves credit for advancing the discipline of dental anthropology in Australia. Together with Campbell, he first studied Aboriginals living at Yuendumu in the Northern Territory of Australia in 1951, just a few years after the previously nomadic Aboriginals had congregated at this Government settlement. Barrett recognized the exciting potential for long-term studies at Yuendumu, particularly those dealing with the dental conditions of a group gradually undergoing transition from a hunter-gatherer life style to a more sheltered existence. Barrett subsequently devoted most of his academic life to the Yuendumu studies, making annual visits (sometimes more frequently) to the settlement until his premature death. As a result of his initiative, we have a fine collection of dental casts and other study material representing Aboriginal children who have been examined serially on many occasions. This collection has provided a valuable and unique source of research material for our own graduate students as well as many scientists from the US, Japan, England and Europe.

Also a dentist by initial training, I became involved with Barrett and the Yuendumu study in 1961 soon after I joined the staff of the University in Adelaide. My field work with Aboriginal children encompassed the 1960s when I also enjoyed the guidance of Andrew Abbie, another pioneer physical anthropologist in Australia. Whereas Barrett was particularly concerned with the dentition of Aboriginals and the mode of dental occlusion, I concentrated more on aspects of child growth and craniofacial biology.

The dental studies continue in Adelaide today but with a much greater diversity than Campbell or Barrett could ever have imagined. Our team has grown as have our interests. Although much remains to be done with the Yuendumu material, our activities are becoming focussed on other topics. For example, under the guidance of my colleague Professor Grant

Dental Anthropology in South Australia (cont'd.)

Townsend, we are involved with genetic studies of the dentition and faces of South Australian twins, already having gathered well over 200 sets of dental casts of twins and their families. These studies are supplemented by investigations of dental conditions and craniofacial morphology in subjects with chromosome anomalies such as Down, Klinefelter and Turner Syndromes.

Another colleague Dr. Lindsay Richards is involved with studies of tooth wear, dental occlusion and temporomandibular joint function. Dr. Nigel Clarke, a periodontist in Adelaide, has devoted several years to the study of cranial collections in Australia and elsewhere. As a result he has developed new and stimulating approaches to the understanding of oral diseases including periodontal and alveolar conditions. Much of this work has been completed with the assistance of Mr. Graeme Pretty of the South Australian Museum who has also been involved in osteological studies of prehistoric Aboriginal remains from Roonka on the River Murray.

A further interest of ours, and a direct spin-off from the growth studies, is craniofacial imaging. We have a close liaison with the Australian Cranio-Facial Unit which is based in Adelaide serving a population of about 40 million throughout Australasia and South-East Asia. Dr. Amanda Abbott, a dental graduate from Adelaide University, is involved with the development of three-dimensional imaging and quantification of the skull from cat-scan digital data. This system has reached an advanced stage and is being used for surgical planning prior to the repair of major craniofacial deformities and trauma as well as for the study of syndromes such as Crouzon and Apert.

Apart from the studies outlined above, our team plays an active role in the Forensic Odontology Unit of the University of Adelaide, assisting with research advice and, at times, case work. We also maintain close contacts with other scientists in Australia who share our research interests although most of these are concerned primarily with related fields such as physical anthropology, forensic anthropology and dental anatomy.

Dental anthropology and craniofacial biology have been a focus of interest for dental academics in Adelaide for over 70 years. We can now recognize several "generations" of teacher-student associations starting with Campbell and progressing through Barrett and Brown to Townsend, Richards and Abbott and their current graduate students. The research efforts have been productive - over 400 titles are listed in our bibliography including papers, books and book chapters, ethnographic films and abstracts.

Finally I would like to take the opportunity to thank Sue Haeussler for the invitation to write a little about our discipline and its origins in South Australia and also to promise a cordial welcome to members who might visit us. Remember, Adelaide has an excellent climate, is right on the coast, an hour's drive from the best wine-producing region in Australia and a delightful city as well - ask Loring Brace, Christy Turner, or Steve Molnar!

Some Dental Traits in Different Evolutionary Lines Leading to Modern Man

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Dental morphological traits have been long used successfully for the taxonomy of both modern and fossil humans. Dental morphology provides the possibility for direct comparisons of modern populations with fossil hominids in order to study the origin of contemporary humans. In particular, an attempt may be made to address questions concerning the time and place of divergence of evolutionary branches leading to the existing taxonomic subdivisions of *Homo sapiens sapiens* subspecies. Special attention must also be paid to the genetic role of the eastern and western branches of *Homo erectus* in the formation of modern mankind, as well as to the problem of hybridization between populations belonging to different evolutionary stages within the evolving genus *Homo*.

Unfortunately, not all dental features can be used for these purposes due to the small number of fossil specimens and the high degree of attrition on the masticatory surface of fossil teeth. However, the analysis of even one or two features can be of interest in such a situation. Therefore, we have chosen two traits for the present study: the structure of the lingual surface of the upper incisors and one of the trigonid crests on the lower molars, the so-called "epicristid" (or middle trigonid crest).

The lingual surface of the upper incisors usually draws the attention of dental morphologists, due to the "shoveling" or strong expression of marginal ridges. However, in this paper shovel-shape, itself, is not the subject of research. Focus is instead placed on the structure of the lingual surface as a whole, including the basal lingual tubercle. The Japanese dental morphologist Mizoguchi (1985) defined three incisor variants according to the degree of expression of marginal ridges and their connection with the lingual tubercle. These are: 1) weak marginal ridges converging towards the cervix, 2) strong parallel non-converging ridges and a large lingual tubercle, and 3) markedly developed and converging ridges and a reduced lingual tubercle.

The middle trigonid crest belongs to the system of trigonid crests of the lower molars. The Dutch dental anthropologist, Korenhof (1982) described three trigonid crests. The distal crest is a good marker of the modern Mongoloid race. The middle trigonid crest has attracted less attention, but is no less important. The middle trigonid crest is formed by the main ridges of the protoconid and metaconid in the middle of the trigonid area. According to the terminology suggested by the American paleontologist, Hershkovits (1971), this feature must be called an "epicristid".

One of the most important assumptions behind all future statements is that a strong genetic component determines incisor type and epicristid. Numerous authors have shown the genetic component of dental features, especially through the use of twin analysis. However,

investigations have also shown the considerable importance of environmental factors and adaptation on the formation of tooth structure. For instance, Mizoguchi found a significant correlation between the degree of expression of shoveling and climatic factors, type of economy, and food composition. Accordingly, inter-population difference was caused by local adaptation to specific environmental conditions.

I cannot fully agree with Mizoguchi's point of view. In my opinion, the geographic distribution of dental characters depends, at least in part, on the ancient pattern of genetic polymorphism connected with the taxonomic differentiation of the genus *Homo* at certain stages of its evolution. Otherwise, it would be difficult to explain 1) the subdivision of some of modern mankind's morphological dental traits into eastern and western divisions, 2) instances in which identical dental types (genetically related) are encountered in different economic and climatic conditions, and 3) cases in which different types occur in similar conditions.

Furthermore, it would be difficult to explain the possibility of revealing traces of ancient admixture of geographically remote populations by using dental morphological data to analyze the consequences of migrations and inter-population contacts. It would also be difficult to explain how evidence of ancient admixture of geographically remote populations can be identified through analysis of dental morphological data to illustrate consequences of migration and inter-population contacts. I could bring in more arguments, but then I would deviate too much from my theme of analysis of genetic aspects of the dental variation in the genus *Homo* connected with its evolutionary history.

Herein we consider the question of the extent to which incisor type and epicristid reflect the genetic relationship and evolutionary progression between fossil hominids and modern man and how far back in time we can trace this progression.

Upper incisor type 1 presently prevails in the dentitions of peoples living in Africa, Europe, and neighboring regions of Asia. This type has persisted in Africa from the beginning of human evolutionary history. Type 1 was seen in *Australopithicinae*, *Homo habilis*, fossil man from Rabat (early *Homo sapiens neandertalensis* or late *Homo erectus*). It can be regarded as the predominant form in Africa during the past ten thousand years. Type 1 is also widespread in the dentitions of peoples living in Europe, and indicates close genetic relations between the modern European population and fossil hominids of Africa. This new evidence supports the "Afro-European" theory developed by Bräuer (1984) and Stringer (1985).

During the period of the Neanderthal stage of evolution, the Africa-Europe transition in dental morphology was apparently interrupted, since Neanderthal man in Europe had upper incisors with a marked degree of shoveling and clearly expressed type 2 incisors, quite similar to *Sinanthropus*. This seems to attest to the possible migration of populations from Asia into Europe during that evolutionary stage. The result was that European Neanderthals had to be, to some degree, of Asiatic origin in their genotype.

Type 1 incisors constantly moved into both Europe and Asia with migrants from Africa who ousted populations having type 2. Along the way some intermediate incisor variants were produced through hybridization (for example, the Amud Neanderthal and the first *Homo sapiens sapiens* from Qafzeh). "Hybrid" forms of incisors continued in Europe for a long time. Incisor shoveling existed in the Upper Paleolithic (e.g. fossil remains from

Romito cave, Italy (Fabbri and Mallegni, 1988) and even in early historic time (73% in Crete [Mizoguchi, 1985]). However, the "hybrid form" is neither a primitive type 2 nor a "pure" type 1, but intermediate between types 1 and 3.

The spectrum of intermediate forms, which had been created through hybridization of types 1 and 2, spread through Asia and became the common morphologic structure of incisors for modern Mongoloid populations. Sometimes the range of variation was closer to type 1, and other times closer to type 3. The latter is due to the inflow of genes from the local aboriginal ancient hominids. This form is characteristic of Arctic races and American Indians.

The other Asiatic forms, in my opinion, should be regarded as hybrid forms. Here, I cannot agree with Mizoguchi who considers these forms as type 1 only. The authentic "pure" form 1 remains in Africa and Europe after the partial elimination of hereditary traits of the Neanderthal population. Mongoloids preserve the hybrid genotype, including both eastern and western components. Here two contradictory views can be reconciled. One has been proposed by Andrews (1984) who advocates the idea of a western origin of modern humans; the other, by van Vark (1983), who suggests the opposite solution of the problem by reducing the genotype of modern humans to only the Asiatic evolutionary branch. In this view both European and Asiatic representatives of contemporary humans have hereditary traits of *Homo erectus africanus* and *Homo erectus asiaticus*. In Europe the eastern traits obtained from Neanderthal man 30,000 to 35,000 years ago were greatly depleted by later waves of African newcomers. However, in Asia the eastern traits were intensified by local eastern admixture.

We now turn to another dental trait, the epicristid. This feature was common among fossil hominids in Africa (*Australopithicinae*, *Homo erectus*, in particular *Atlanthropus* [editor's note: a generic name for middle Pleistocene African hominids]), in preneanderthal forms (Arago, Mauer), and in many European Neanderthal forms (Erinsdorf, Krapina, Hortu, Le Mousteier, La Fate). Epicristid does not seem to characterize fossil hominids in Asia. (No instances occur in the permanent molars of *Sinanthropus*.)

The combination of epicristid and incisor shoveling (Erinsdorf) can be regarded as evidence for the hybridization of the eastern and western evolutionary branches in Europe. The epicristid persisted in Europe into the Upper Paleolithic (for instance, the Saint-Rabier finding in France [Patte, 1962, 1963]). My unpublished data for modern populations is also of interest here.

The highest frequency of epicristid in modern ethnic groups has been found in Africa (Mali, Ethiopia). This fact suggests the retention of local ancestral features since very remote times, in a manner similar to the model we have been discussing for the distribution of type 1 shoveling. The epicristid trait penetrated into Europe from Africa at different stages of evolution (preneanderthals, *Homo sapiens sapiens*) and remains in Caucasoid (Euripeoid) populations, especially southern groups. The frequency of epicristid in Europe and India reaches 10% (Brahmans of India, Tajiks). The trait is completely absent in Mongoloid populations of Central Asia (Mongols, Touvinians [editor's note: native people of the Tuva Autonomous Republic in southern Siberia]) and American Indians (Peru) which I have studied. This trait may have disappeared in the course of time during migrations and hybridization processes. In western humans, one can observe a similar process, the

elimination of shovel-shaped incisors.

The analysis of the evolutionary and taxonomic significance of these two dental features, incisor form and epicristid, enables us to draw the following conclusions:

1. The stable persistence of incisor type 1 in Africa since very remote time and its subsequent spreading throughout the whole world as a basic morphological structure corroborates the so-called Afro-Europe theory concerning the African roots of *Homo sapiens sapiens* (Brãuer, 1984; Stringer, 1985), and, in part, the genetic monocentric hypothesis of A. Wilson and V. Sarich based on mitochondrial DNA data ("Mitochondrial Eve theory"). However, contrary to Wilson's theory, the distribution of dental features attests to the widespread process of hybridization between the representatives of different branches and stages of evolution within the genus *Homo*, especially in Europe and Asia. To a great extent, modern African populations seem to preserve the ancient aboriginal "African" type for such dental traits as incisor type 1 and epicristid.

2. The morphological sequence in the distribution of incisor shoveling in Asia and epicristid in Africa, which can be traced back to the local *Homo erectus*, shows that not only a single common root but also genes of the local ancient hominids participated in the formation of the final genotype of modern man. In this respect, our point of view is compatible with both monocentric and polycentric theories for the origin of modern human races.

3. There were two waves of migrations from Africa to Europe: one on the level of *Homo erectus* (or preneanderthal man) and another on the level of *Homo sapiens sapiens* (through western Asia). Representatives of the first wave encountered the immigrants from Asia. According to dental data, hybridization occurred, resulting in the morphological combination of shoveling and epicristid.

4. *Homo sapiens sapiens* from the very beginning (Qafzeh) were in contact with Neanderthal populations on the way to Europe via the Near East and with Neanderthals in different regions of Europe. Hybridization must have taken place between *Homo sapiens sapiens* and *Homo sapiens neandertalensis*.

5. *Homo sapiens sapiens* of the Upper Paleolithic dispersing throughout Asia experienced strong genetic influence of local hominids. As a result, a wide range of variation between incisor types 1 and 2 arose, with the southern forms closer to type 1 and northern forms closer to type 2. The frequency of epicristid sharply decreased.

6. We suggest the following solution to the problem of an African or Asiatic origin of *Homo sapiens sapiens*: the whole subspecies *Homo sapiens sapiens* has a common basic African root. However, the genotype of *Homo sapiens sapiens* includes admixture of local populations of African, European, and Asiatic hominids belonging to different evolutionary stages. Moreover, from the distribution of incisor type 1 and epicristid, both western and eastern evolutionary branches of *Homo erectus* participated in the formation of modern humans.

7. The processes of hybridization within the genus *Homo* on all levels and stages supports the hypothesis of a reticular pattern as the characteristic mode of human evolution since at least the time of *Homo erectus*. This also provides evidence for consolidation of all representatives of the genus *Homo* into a single species, *Homo sapiens*.

Some dental traits in different evolutionary lines leading to modern man (cont'd.)

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The original text of this paper was delivered on November 23, 1991, at the 90th Annual Meeting, American Anthropological Association, Chicago.

Available for Study

Spencer R. Atkinson Cranio-Osteological Collection

The Spencer R. Atkinson Cranio-Osteological Collection consists of more than 1400 human crania. Primarily modern autopsy room specimens, the S.R.A. collection offers extraordinarily well-preserved adult and immature series. An age graded series of nearly 400 crania spans from in-utero to adult. Ideal for grown and development and comparative studies, the S.R.A. also houses a number of pathological crania (hydro, microcephalics, cranial dysostoses, etc.). In addition to the collection of complete crania, a series of sectioned crania and cranial components are also housed in the collection. The library also houses a vertebrate anatomy collection of over 600 fully inventoried specimens.

For information, please contact:

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The Epicristid or Middle Trigonid Crest Defined

Alexander A. Zubov

The epicristid or middle trigonid crest connects the protoconid and metaconid in the middle of the trigonid. The difference between the epicristid and the distal trigonid crest is illustrated below:

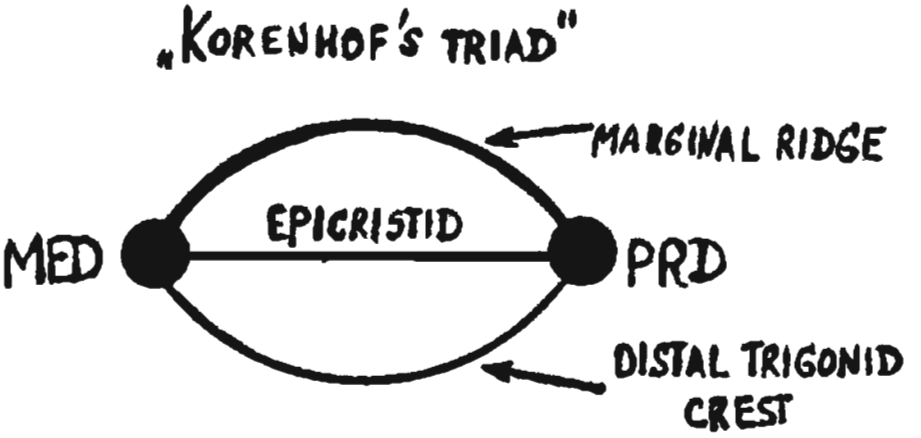
2prd* distal trigonid crest

The distal crest is situated distally from furrow 2 prd.

2prd epicristid

The epicristid is situated mesially from furrow 2prd.

Epicristid was described by C.A.W. Korenhof (1982) along with two other crests of the trigonid. Korenhof singled out: 1) marginal ridge, 2) middle ridge (crest), 3) distal ridge.



The term epicristid was introduced by the American Paleontologist Hershkovits (1971) who suggested a new, detailed classification of structures of mammalian teeth. Epicristid has been found in *Australopithicinae, Homo habilis, Homo erectus mauritanicus (africans)*, in European preneanderthal forms (Arago, Mauer) and in many European Neanderthal skulls (Le Moustier, Erinsdorf, Krapina, La Fate). No case was found in *Sinanthropus*.

This trait can be regarded as African. The distribution in modern populations is:

Africa (Mali, Ethiopia)	30-35%
South Caucasoids (Caucasus, Middle Asia, India)	4-10%
Modern Mongoloids (series of Mongols and Touvinians)	0%
American Indians (Peru)	0%
American Indians (Pima series, Dahlberg Series, Arizona State University)	2 cases

The distribution of the epicristid is evidence for the African origin of modern Negroid populations, as well as the fact of a very deep root of this race in the African continent. (Succession can be traced back to *Homo erectus*.)

Epicristid or Middle Trigonid Crest Defined (cont'd.)

*Editor's note: 2prd is the short form notation for one of Zubov's odontoglyphic features. 2prd means the second furrow on the protoconid. According to the system of odontoglyphics the mammalian cusp tends to be divided into three sections separated by furrows. These are second order furrows, since first order furrows separate the cusps from one another. On the protoconid furrow 2 is a second order furrow which is located more distally than furrow 1.

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Figure 1. A rare tricuspid upper first premolar in an adult dentition from the Chavez Pass site, Arizona. (Photograph by Diane Hawkey)

Tricuspid Premolars from Chavez Pass, Arizona

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Three tricuspid premolars were found during dental trait scoring of a skeletal population from Chavez Pass, an archaeological site located in northern Arizona, approximately 30 miles south of present-day Winslow. The site had been severely disturbed by pothunters, creating a collection of scattered and disassociated bones. Very few discrete individuals were present. Using the Arizona State University Dental Anthropology System (Turner et al. 1991) to score the dental traits of the population, the authors made the following observations:

The first example of a tricuspid premolar, 81/ChP/76N/114E/B, is a maxillary left first premolar from an adult individual of indeterminate sex, approximately 18-25 years old (Fig. 1). The maxillary right first premolar from the same individual is bicuspid. The second example, 81/ChP/50N/160E, is a maxillary left first premolar from an adult male individual, approximately 20-30 years old. The antimere, the maxillary right first premolar, is the normal bicuspid form. The third example, Specimen #6106, is a maxillary right first premolar from an adult male individual, approximately 20-30 years old. The antimere, the maxillary left first premolar, is missing postmortem. The second premolars of these individuals, where present, are the normal bicuspid condition.

All three tricuspid premolars display two distinct cusps on the lingual side of the crown. The lingual cusps are approximately one-half the size of the buccal cusps. Specimens 81/ChP/76N/114E/B and #6106 are slightly worn on their occlusal surfaces, scoring 0-1 and 1, respectively, on the ASU system. Wear is greatest on the buccal cusp in both individuals.

The occlusal surface of 81/ChP/50N/160E is worn to a greater degree than that of the other two examples, having a score of 2 on the ASU system. The mesiolingual cusp is slightly larger than the distolingual cusp. Wear is greatest on the buccal cusp with dentin exposed, although both lingual cusps are also worn with spots of dentin exposed. The dentin exposure on the buccal cusp is triangular in shape.

On Specimen #6106 the mesiolingual cusp originates from a distinct root radical, which is fused to a root radical at the base of the buccal cusp, forming a single root. The distolingual cusp originates from the same root as the buccal cusp. In addition, the root socket of the antimere (maxillary left first premolar) is similar in form, suggesting that the maxillary left first premolar may also have been tricuspid.

Prior to this study, three individuals were known to exhibit tricuspid premolars (Turner, personal communication). Turner et al. (1991:17-18) state that tricuspid premolars are extremely rare (1/8000 teeth, or 0.0125%). The three individuals from Chavez Pass have doubled the known sample to six. The authors would appreciate communication from other Dental Anthropology Association members concerning other examples of tricuspid premolars.

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Counting Perikymata Using a Low-power Stereomicroscope

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Detailed studies of perikymata and enamel hypoplasia defects have considerable potential, but are both time consuming and difficult to carry out. The normal method for constructing chronologies of perikymata on the surfaces of tooth crowns is to count them on photomicrographs taken with a scanning electron microscope. This involves the production of epoxy replicas of the crown surface, together with the use of expensive equipment which is not universally available. At spacings of 120 μm down to about 20 μm, the grooves of perikymata can be made out clearly with a high quality, but otherwise ordinary, stereomicroscope under reflected light. The more coarsely spaced perikymata grooves near the occlusal surface of the crown need only magnifications of x10 or so to see them, and x40 is at least adequate for distinguishing the finer grooves. For most studies, the main reason for using scanning electron microscopy to examine them is the much greater depth of field which makes photomicrography much easier. Camera attachments are available for many stereomicroscopes and, with a little practice, photographs of crowns seen in reflected light can be taken. The difficulty is that the strongly curved surface of the crown can only be properly focused in one small part of the field of view, so that a very large number of photographs is needed to cover one crown adequately.

In previous studies, the present author found photomicrographs essential for keeping a proper count of perikymata grooves, and maintaining a sense of position on the tooth crown. This made the scanning electron microscope indispensable. With the arrival of a new Wild stereomicroscope, complete with a drawing tube assembly, it was found possible to avoid photography altogether. The drawing tube makes it possible to follow, superimposed over the image of the specimen being examined, the movements of a hand and pencil on a sheet of paper taped to the bench beside the microscope. At low magnifications, an outline of the crown can be drawn, with the positions of hypoplastic defects and particularly prominent perikymata grooves marked and annotated. At higher magnifications, perikymata groove counts can be made simply by moving the tip of the pencil in the eyepiece image in a transect down a particular part of the crown and making a tick in the position of each groove.

With carefully illumination, the original teeth can be examined in this way, although dental enamel is rather too glossy and reflective for comfortable study. To counteract this, teeth can be coated, either in a sputter coater or using Jerome Rose's ammonium chloride method (see *Yearbook of Physical Anthropology* **33**, page 95). These coatings can be cleaned off simply by wiping. It is also possible to examine epoxy replicas under a stereomicroscope, with either reflected or transmitted light.

Colyer's Variations and Diseases of the Teeth of Animals Second Edition. Revised by A.E.W.Miles and C. Grigson. Cambridge University Press, Cambridge, United Kingdom. 1990. IX - 672 pp. 814 Half-tones and 48 Line diagrams. Retail price: 390.00.

Daris R. Swindler

Sir Frank Colyer (1866-1954) published the first edition of Colyer's Variations and Diseases of the Teeth of Animals in 1936 and it quickly became an indispensable reference. The book was a major contribution to the field of odontology and continues to be widely used and cited. It has, however, been out of print for many years, since much of the original plates and text was destroyed in an air raid in 1940. Subsequently, it was decided to produce a new and totally revised edition, rather than publish a facsimile edition. The authors have preserved the original framework of the book and nearly all of the original figures, while adding many new figures and references commensurate with the advances in knowledge over the past 55 years. The main substance of revision in this new edition consists of Colyer's text rearranged taxonomically.

The book consists of four Sections and 25 Chapters. Chapter 1 is a new General Introduction which contains much conceptual material (i.e. morphogenetic fields, supernumerary teeth, connate teeth, and genetic and environmental influences on dental variation), that helps the reader to understand the causes and significance of the more factual material that follows. In general, the text assumes some knowledge of tooth structure, processes of tooth development, and comparative dental anatomy.

Section 1 contains Chapters 2 to 8, and deals with Variations in Number, Size, and Shape of Teeth. Chapter 2 is a short introduction to the remainder of the Section and presents the material taxonomically. The chapter begins with an excellent discussion of the primates (pp. 19-61) before considering in detail the carnivores, seals, whales ungulates, rodents, rabbits, insectivores, bats, and marsupials. In Section 2, Variations in Positions, the order of presentation is the same, beginning with primates (pp. 161-237) and ending with marsupials. These two Sections make up the first half of the book and contain something for anyone interested in mammalian odontology.

Section 3, Abnormalities of Eruption, is the shortest Section of the book. However, the Section contains a wealth of interesting and fascinating information garnered from a wide range of mammals. One of the most striking examples of the overgrowth of a tooth (mandibular central incisor) of an American beaver (*Castor fiber*) that I have ever seen, is found in Fig, 17.1, p. 356. Incidentally, one can see the original specimen, which was collected by John Hunter, in the Hunterian Museum of the Royal College of Surgeons.

Section 4, Other Disorders of the Teeth and Jaws, is the final and longest Section of the book. The eight chapters of this Section contain comprehensive information on a variety of subjects including jaw injuries, injuries of the teeth, enamel hypoplasia, dental caries, tooth destruction from causes other than caries, dento-alveolar abscesses, periodontal diseases, and odontomes.

This marvelous tome, while mainly concerned with the dentition of living mammals, contains some mention of the paleontological literature. Moreover, whereas the original book was restricted to mammals, the authors of this edition have thought the non-mammals to be

of too much interest and importance to ignore completely. As a result, comments and observations concerning the dentitions of fishes, amphibia, and reptiles are made in appropriate places.

The figures, both drawings and photographs, are generally quite clear. As a result, the reader has no problem in locating a small tuberculum sextum on the mandibular third molar in *Macaca nigra* or supperation in the mandible below the site of fodder wedging in *Equus caballus*. The index is well organized and, considering the enormous amount of data presented in this book, the reader will be most grateful for this attention. The References have been brought up to date and include the latest information in the field of comparative mammalian odontology. I counted them. There are 1380 references!

Colyer's Variations and Diseases of the Teeth of Animals is, at long last, available again. It should continue to have a wide readership from anthropology to zoology, including dentists, veterinarians, and of course, dental anthropologists. The only complaint will be the price. Even today, with our inflated economy, the price is beyond most of our pocket books.

Human Biology Interest Group Discussion List

Humbio-L is an unmoderated discussion list dealing with biological anthropology, adaptation, environmental stress, biological race, growth, genetics, paleolanthropology, skeletal biology, forensic anthropology, paleodemography, paleopathology, primate biology, and behavior. This discussion list is open to all interested groups or organizations.

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Update on Mitutoyo

A.M. Haeussler

The last issue of DAN contained a review of Mitutoyo calipers and small printer along with a promise for information about hardware and software for downloading data directly into a computer. Since then, Jack Weaver, the western United States Mitutoyo representative, and an individual from a local distributor spent several hours in the ASU Laboratory of Dental Anthropology displaying and demonstrating their products. As a result, we have good news and bad news, along with another promise of an update in the next issue of DAN.

The first piece of good news is that it is possible to send data from the printer or from a device called a "data logger" to a computer. The bad news is that this method assumes that you have your own program for accepting and analyzing the data.

The second piece of good news is that Mitutoyo manufactures a software program called M-STAT. Using M-STAT, a worker can transmit measurements directly from calipers via a multiplexer to the program. The program indeed handles a large number of variables (900 per data file) and measurements (512,000 per data file). The bad news, as I understand it, is that data must be entered one variable at a time. For example, all the central incisor mesiodistal dimensions in a sample must be entered before you can go on to the bucco-lingual measurements. The only way to get around this would be to have a different multiplexer for each dimension for each tooth or else an interfacing unit capable of handling 32 variables (assuming that you measure mesio-distal and bucco-lingual dimensions per antimere pair). Considering the $607.00 price for a simple multiplexer which handles one "tool", or in the case of dental anthropology, one type of measurement, the cost of this type of a process would be beyond the most generous research grant.

The third piece of good news is that, after all the measurements have been entered, the M-STAT software computes descriptive statistics and prints out eight types of graphs. The bad news is that the graphs and other print outs, at least in the "demo" program, are formatted only for an Epson printer. The print command produced only blank paper when the computer was connected to an HP Laserwriter III. The final piece of bad news is that you need anther program, M-STAT Analytical in order to calculate anything more complex than descriptive statistics for one variable at a time. In my opinion, the $495.00 for M-STAT, $895.00 for M-STAT Analytical, $195.00 for M-STAT support, and $250.00 for M-STAT Analytical support are beyond the budget of research anthropologists.

Unfortunately for individuals engaged in research, all of the Mitutoyo products in which we are interested are manufactured for industry and appear to be aimed at quality control. However, Jack Weaver has recently given me the names of two members of the ASU Department of Statistics, who have information about research applications for the M-STAT programs. I am hoping that these individuals can assist us, and will report on my findings in the next issue of DAN.

In the meantime, If any DAN readers have solved the problem of downloading data into a computer, or have found or devised a program analyzing these data, the editors will be happy to publish information about your methods and recommendations.

Report from the Secretary-Treasurer

Diane Hawkey, ASU

1. DAA Business Meeting

Our 1992 meeting is scheduled for April 3rd from 5:00 to 6:00 pm, at the Hotel Riviera, Las Vegas, Nevada. As usual, our business meeting will be held in conjunction with the annual meeting of the American Association of Physical Anthropologists (April 1 - 4).

2. Elections

Daris Swindler (President 1990-1992) and Diane Hawkey (Secretary-Treasurer 1990-1992) will complete their terms of office, and replacements will be elected at the next business meeting. The following members have been nominated:

President: Stephen Molnar (Washington University)

Secretary-Treasurer: Joel D. Irish (Arizona State University)

Executive Board Member: Linda Winkler (University of Pittsburgh at Titusville)

3. Changes in the Constitution and By-Laws

The following revised version of the Dental Anthropology Association Constitution and By-Laws incorporates a number of amendments made during the past few years. Please note that a proposed change (as underlined in text) will combine the duties of the Nominations-Elections Officer, Program Chair, and Meeting Facilitator into one Executive Board officer, who will serve for three years. Members will have the opportunity to discuss the amended version and vote on its formal adoption during our 1992 meeting.

CONSTITUTION AND BY-LAWS
DENTAL ANTHROPOLOGY ASSOCIATION

ARTICLE I: Name

The name of this organization shall be Dental Anthropology Association (DAA).

ARTICLE II: Objectives

The general nature, object and purpose of this Association shall be for any and all of the following purposes:

(a) For the exchange of educational, scientific and scholarly knowledge in the field of dental anthropology.

(b) To stimulate interest in the field of dental anthropology.

(c) To publish a newsletter, the Dental Anthropology Newsletter (DAN), the Official Publication of the Dental Anthropology Association (DAA).

Constitution and By-Laws Dental Anthropology Association (cont'd.)

ARTICLE III: Membership

Section 1. Membership in this organization shall be of two classes: (a) Regular (b) Student.

Section 2. Those eligible for membership in this organization shall be persons who have an academic, research, and/or clinical interest in dental anthropology.

ARTICLE IV: Board of Directors

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

Section 2. The Board of Directors shall meet annually, exceptions to be determined by the President.

Section 3. Special meetings may be called by the President.

Section 4. A quorum will consist of those members present.

Section 5. The elected officers of the Association shall constitute the Executive Committee, which may meet to consider any important matters which may arise between meetings of the Association. Every member of the Executive Committee having been notified of meeting, those present shall constitute a quorum.

Section 6. Members of the Association may attend the Board of Directors Meetings and may vote. They may have the privilege of the floor by consent of the presiding officer.

ARTICLE V. Officers and Elections

Section 1. Designation of officers

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

Section 2. The slate of incoming officers shall be presented by the Nominations-Elections officer to the General Membership before the annual meeting.

Section 3. Nominations may be made from the General Membership at the annual meeting.

Section 4. If there is more than one nominee for an office, election shall be secret ballot counted by the Secretary-Treasurer. In case of a tie the President shall cast the deciding vote. If only one nominee is presented for an office, that office maybe filled by instruction from the floor to have the Secretary-Treasurer cast a unanimous vote for such nominee.

Section 5. Vacancies among officers may be filled by vote of the remaining members of the Board of Directors.

Constitution and By-Laws Dental Anthropology Association (cont'd.)

ARTICLE VI: Duties of Officers

Section 1. President

(a) Shall preside at all General Membership Meetings and all Board Meetings.
(b) Shall be an ex officio member of all standing and special committees.
(c) Shall appoint the chairs of all standing and special committees.
(d) Shall serve as a liaison officer between the Association and other professional organizations.

Section 2. Secretary-Treasurer

(a) Shall assist the President in the discharge of his or her duties.
(b) Shall keep the minutes of meetings of the Board of Directors and submit them for approval. A copy of such minutes shall be sent to the President within ten days of the meeting.
(c) Shall keep an accurate roll call of each Board Meeting.
(d) All reports of officers and committees shall be filed with the secretary for record.
(e) Shall conduct the official correspondence of the Association under the direction of the President.
(f) Shall be the custodian of all funds of the Association which he or she shall disburse only on order of the Board of Directors. All bills must be accompanied by an itemized statement or receipt when reimbursement is in order.
(g) Shall send dues statements to all eligible members.
(h) Shall submit a regular written report at each Board Meeting, and at the Annual Meeting shall present a full and written report of the finances of the Association.
(i) Shall file all appropriate federal, state, and local forms according to law.

Section 3. Editor of the Newsletter

(a) Shall publish the Newsletter.

Section 4. Executive Board Member

(a) Shall serve as Nominations-Elections officer, Program Chair, and Meeting Facilitator.

ARTICLE VII: Committees

Section 1. Standing committees may be established at the discretion of the President.

Section 2. Special committees may be created by the Board of Directors to perform the special function for which they are so created. The chair of such committees shall be appointed by the President.

ARTICLE VIII: Meetings

Section 1. Unless otherwise ordered by the Association or the Board of Directors, regular meetings shall be held annually.

Constitution and By-Laws Dental Anthropology Association (cont'd.)

Section 2. Special meetings may be called by the President with the consent of the Board of Directors, with adequate notification of the membership.

Section 3. The annual meeting shall be designated as the Annual Meeting held in conjunction with the American Association of Physical Anthropologists.

ARTICLE IX: Dues and Finance

Section 1. Dues

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

(b) Dues of this organization shall be set by the Board of Directors with the approval of the general membership. The membership shall be notified of the proposed change at the Annual Meeting.

Section 2. Finance

(a) The Finance Committee shall consist of the Board of Directors.

(b) The Finance Committee shall present a proposed budget to the membership for approval at the Annual Meeting.

(c) The disbursement of monies not provided for in the budget shall be voted upon at the Annual Meeting.

(d) The signature of the President and the Secretary-Treasurer shall be on record at the depository and either signature is valid for all banking transactions.

Section 3. The fiscal year shall be from June 1 of one year through May 31 of the following year.

ARTICLE X: Amendments and Rules of Order

Section 1. The By-Laws may be revised or amended at any meeting of the general membership by a two thirds vote of those present and eligible to vote, the proposed amendments or revisions having been mailed to the general membership thirty (30) days prior to date the vote is to be taken.

Section 2. Robert's Rules of Order, Newly Revised, shall be the parliamentary authority for all matters of procedure not specially covered by the By-Laws of this organization.

ARTICLE XI: Dissolution of Dental Anthropology Association

No person shall possess any property right in or to the property or assets of the Association. Upon dissolution of the corporation, and after all obligations are satisfied, all assets shall be distributed exclusively to the American Association of Physical Anthropologists.

Selected Bibliography of Recent Publications

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Volume 6, Number 2 January 1992

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Volume 6, Number 2 January 1992

Publication of the Dental Anthropology Association

Published three times yearly

Laboratory of Dental Anthropology

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DENTAL ANTHROPOLOGY ASSOCIATION
MEMBERSHIP APPLICATION / RENEWAL FORM

Membership is for the calendar year and includes a one-year subscription to the Dental Anthropology Newsletter (three issues published annually).
Dues are $10.00 for regular membership, and $5.00 for student members.

Please make your check payable to the DENTAL ANTHROPOLOGY ASSOCIATION, and mail to the following address:

Diane E. Hawkey
DAA Secretary-Treasurer
Department of Anthropology
Arizona State University
Tempe, AZ 85287-2402
USA

The Association has a limited number of sponsored memberships available for foreign members. Please send a letter to the Secretary-Treasurer if you are requesting sponsorship. Contributions in any amount towards sponsoring foreign members are also welcome.

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The information on your address label indicates your current DAA membership status. If "1991" or "1992" appears after your name, your dues have been paid to the end of that year. If a series of asterisks (***) appear after your name, please remit your annual membership fee in order to maintain active status in the organization. The 1992 membership fees are now due.

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The Dental Anthropology Newsletter
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