Woodland to Mississippian dietary transitions in Indiana as indicated by dental microwear analysis.

C.W. Schmidt. University of Indianapolis.

Dental paleopathology and macrowear data from a recent study by the author suggest that, in Indiana, the Late Woodland diet is intermediately cariogenic and macroscopically abrasive when compared to diets representing the Early/Middle Woodland and Mississippian periods. It is hypothesized that, like the caries and macrowear data, the Late Woodland microwear data are intermediate.

Dental microwear analysis was conducted on the teeth of 22 Early/Middle Woodland, 18 Late Woodland, and 23 Middle Mississippian adults predominantly from Indiana. The microwear analysis followed standard procedures for casting/molding, scanning electron microscopy, photography, and feature scoring (i.e., Microwear 2.2, Ungar, 1995). Data were collected for the following variables: percentage of pits, pit length, and scratch width. Quantitative comparisons were conducted using ANOVA.

The results suggest that the Late Woodland dental microwear profile is not intermediate. The Late Woodland values are virtually indistinguishable from those of the Early/Middle Woodland. By contrast, the Late Woodland profile has significantly more pits and wider scratches than that of the Mississippian.

The current study suggests that the increase in cariogenesis during the Late Woodland did not result from substantial changes in food preparation since the microwear did not change. Moreover, the new cariogenic foods did not immediately replace what was eaten previously. By the Mississippian, the diet was markedly different in that it was both softer (e.g., had fewer pits) and less abrasive (e.g., had narrower scratches) than the preceding Woodland diets.

Funded by a grant from the Indiana Academy of Science.

Timing characteristics of two different facial signals: Deliberate and spontaneous smiles.

K.L. Schmidt[1], Z..Ambadar[2], L.I. Reed[2], J.F. Cohn[12] [1]Dept. of Psychiatry, University of Pittsburgh, [2]Department of Psychology, University of Pittsburgh.

The smile is a frequently observed, multi-functional social signal in humans. Physical characteristics of the human smile, primarily upturned and laterally drawn lip corners, are consistent across individuals and form the defining characteristic of this facial signal. Inferences about the nature and purpose of individual smile displays, however, are often based on the timing of lip corner movement. Previous qualitative studies have proposed that the social impact of the smile may depend on the speed and duration of lip corner movement. In this study, movement characteristics of smiles known to be deliberate (directed action task) were compared with spontaneous smiles observed in the same individuals (N=65). An automated tracking algorithm provided data on the position and timing of lip corner movement in these smiles. A within subject repeated measures analysis showed that both maximum speed ($F(1,64)= 118.65$, $p<0.001$) and amplitude ($F(1,64)= 113.90$, $p<0.001$) of lip corner movement differed between spontaneous and deliberate smiles. Duration of smile onset did not differ between the two types of smiles ($F(1,64)=0.074$, $p=0.78$) Spontaneous smiles are both faster and larger in amplitude during onset, suggesting possible neurobiological differences in production. Contrary to the results of previous studies, we did not find that asymmetry differed between spontaneous and deliberate smiles; both displays showed a moderate degree of asymmetry.

Intact non-collagenous extracellular matrix proteins in ancient human bones from different time periods.

T.H. Schmidt-Schultz[1], M. Schultz[2]. [1]Department of Biochemistry, University of Göttingen, [2]Department of Anatomy, University of Göttingen.

Ancient bones in a good preservation state, controlled by microscopic techniques, conserve extracellular matrix proteins over thousands of years. Using a special technique (Schmidt-Schultz and Schultz 2003), intact extracellular matrix proteins extracted from ancient bones are solubilized, separated by 1-dimensional and 2-dimensional electrophoresis and identified in western blots by special antibodies against different human extracellular matrix (ECM) molecules of bone. ECM human bone molecules such as osteonectin, osteopontin, alkaline phosphatase were confirmed by different types of specific antibodies in recent and archaeological human bone samples of individuals of different age groups. The archaeological bone samples date from different time periods (e.g., Late PPNB, Bronze Age and the Middle Ages).

The preservation of intact extracellular matrix proteins in ancient bones dating from recent times into the Late PPNB and the use of reliable new techniques to identify these proteins represent a big challenge for further research. In combination with the results of macro- and microscopic examinations, the results of the biochemical investigation will make it possible to obtain a better understanding of bone in health and disease.

Analysis of chimp-human brain differences via non-rigid deformation of 3D MR images.

P.T. Schoenemann[1], B.B. Avants[2], J.C. Gee[2], L.D. Glotzer[1], M.J. Sheehan[1]. [1]Department of Anthropology, University of Pennsylvania, [2]Department of Radiology, University of Pennsylvania.

Understanding human brain evolution requires knowledge of exactly how human brains differ from those of our closest ancestors. While differences in overall size are easy to gauge, differences in relative proportions of individual cortical areas are more difficult. Partly this is because areas of interest often do not have obvious and easily-delimited sulcal boundaries, and the methods used have relied on delineating areas by hand. One area of particular interest is prefrontal cortex, which is both behaviorally interesting and particularly difficult to delimit.

We apply a novel approach to this question by using non-rigid deformation techniques – developed originally for functional imaging studies to morph sets of human brains into the same coordinate system – to a set of 6 *Pan troglodytes* (3 male, 3 female) and 12 *Homo sapiens* (6 male, 6 female) brain MRIs. Because these methods are voxel-based, local deformation in one area can be independent of deformation in another area. The average *Pan* brain was non-rigidly deformed into the average *Homo* brain resulting in a 3D deformation matrix describing the distortions necessary to transform one into the other on a voxel-by-voxel basis. Within-species sets of deformation matrices are used to determine the significance of species differences. This method bypasses the need to individually delimit regions of interest by hand, and results in a global atlas of species differences covering all areas of the brain. Our results confirm that the prefrontal cortex occupies a proportionately larger part of the brain of *Homo sapiens* than it does in *Pan troglodytes*.

Image analysis research using MRI of human and primate brains has suggested that the frontal lobe as a whole in humans is not especially elaborated, while other research has suggested that the prefrontal

itself is larger as a percentage of total cortex than in non-human primates.

Kinematics and kinetics of bonobo (*Pan paniscus*) climbing.

K. Schoonaert[1,2], K. D'Août[1,2], D. Lauwers[1], P. Aerts[1]. [1]Department of Biology, University of Antwerp, Belgium, [2] Centre for Reasearch and Conservation, Antwerp, Belgium.

In order to gain new insights into the evolution of hominid bipedalism, the understanding of the relationship between form and function in extant primates is essential. Despite a lot of great kinesiological studies on living primates, sufficient data on the kinematics and particularly kinetics of climbing are still lacking. This study focuses on 3D-kinematics and kinetics of arboreal locomotion in bonobos.

We used a setup, consisting of an inclinable pole instrumented with 3D force transducers, that allowed for measurement of dynamic forces applied by bonobos during locomotion on sloping substrates. Climbing sequences were recorded simultaneously by four video cameras. Substrate reaction forces (1000 Hz) and coordinates of each joint (50 Hz) were used to calculate total, quasi-static joint moments during a complete stride. Moment arms of important hind limb muscles (needed for the interpretation of the calculated joint moments) were measured for an adult female, using the 'tendon-travel method'.

Analysis of sequences on a slope of 30° revealed that the highest moment of the hind limb is generated in the hip. Moments are smaller for respectively knee and ankle joints. Front limb joint moments are much smaller, with the shoulder having the highest values.

In general, there is good correspondence between the joint angle at which the calculated moment is high, and the muscle moment arms of the extensors of the joint considered. Future research should elucidate whether this remains true for climbing at steeper angles, and for terrestrial locomotion.

Metric variation in the dentition of *Ouranopithecus macedoniensis* (de Bonis and Melentis, 1977).

C.M. Schrein. Department of Anthropology, Arizona State University.

This study examines the relative variation and degree of sexual dimorphism in the dental metrics of the Miocene fossil hominoid *Ouranopithecus macedoniensis*. It tests the hypothesis that the coefficient of variation (CV) and the sexual dimorphism index (SDI) of the fossil sample do not exceed those of extant great apes. The study uses mesiodistal (MD) and buccolingual (BL) tooth measurements from *Ouranopithecus* mandibular canines (n=7) and first molars (n=6) from Ravin de la Pluie and Nikiti 1, Greece, and from extant *Gorilla*, *Pan* and *Pongo* samples (n>40). Bootstrapping (resampling with replacement) is the method used to compare the fossil sample to the comparative samples.

Plots of the metric data for *Ouranopithecus* canines and first molars both produce bimodal, non-overlapping distributions. The relative variation in *Ouranopithecus* canines does not exceed that in *Gorilla* or *Pongo*; however, the relative variation in lower M1 MD exceeds that for all extant apes. The probability that the degree of relative variation in the *Ouranopithecus macedoniensis* lower M1 BL width measure would be found in extant ape populations is also low (<.01 in *Pan* and *Gorilla* and <.06 in *Pongo*). The SDIs for *Ouranopithecus* canines approximate the values for *Pongo* and *Gorilla*. The SDIs for M1 MD and BL exceed 1.20. These are greater than the values for any extant great ape. The high levels of molar metric variation in *Ouranopithecus macedoniensis* would appear to be the consequence of extreme sexual dimorphism, similar to what is observed in the Miocene ape from China, *Lufengpithecus*.

Native American interests and human genetic research.

K.B. Schroeder[1], R.S. Malhi[1,2], J.A. Eshleman[1,2], D.G. Smith[1,3]. [1]Molecular Anthropology Lab, University of California, Davis, [2]Trace Genetics LLC, Davis, CA, [3]National California Primate Research Center, University of California, Davis.

Ethical and legal questions that have arisen with advances in human genetic research have found an arena for discourse in the unprecedented political voice of Native Americans, as evidenced by organizations such as the Indigenous Peoples' Council on Biocolonialism and articles published in journals like *Gene Watch* and *Cultural Survival Quarterly*. However, these political interests have also raised concerns that may be regarded as red herrings, such as the mining of the Native American genome or the creation of super viruses targeted at Native Americans. These red herrings detract from more imminent issues, including the appropriateness of group consent, the patenting of genes, and the storage of samples, that potentially threaten both Native American sovereignty and progress in genetic studies. Such issues demand increased dialogue among Native Americans, genetic researchers, government agencies, and lawyers.

In this study, we anonymously survey 83 Native Americans affiliated with tribes focused in California, plus a sampling across the United States, to assess the concerns and interests of Native Americans as they pertain to human genetic research. The preliminary results of this survey suggest that the opinions of many Native Americans on human genetic research may be inaccurately reflected by Native American activists. The results also reveal specific issues researchers may address to further unify the interests of Native Americans with those of researchers. The engagement of Native Americans in this survey has laid a foundation for increased dialogue and collaboration between Native Americans and anthropologists.

Does digestion time limit group size in folivorous primates?

O. Schülke[1], M.K. Chalise[2], J. Nikolei[3], D. Podzuweit[4], J.U. Ganzhorn[5], C. Borries[1], A. Koenig[1]. [1]Department of Anthropology, Stony Brook University, [2]Natural History Society of Nepal, Katmandu, [3]Ramnagar Monkey Research Project, [4]Institute of Anthropology and Human Biology, [5]Institute of Zoology, University of Hamburg.

In general, it is assumed that folivorous primates are facing lower feeding competition than frugivores. Consequently, group size of folivores should be less constrained. In contrast to this assumption, however, most folivorous primates live in smaller groups than frugivorous. One possible explanation for this 'folivore-paradox' may be the existence of a different mechanism constraining group size. Usually, increased travel expenses with increasing group size might be compensated for by prolonged feeding time at the expense of resting time. A highly fibrous diet, however, may not allow for such a solution, because resting time is vital for fermentation. Hence, folivores might be constrained by digestion time. We tested this idea using long-term data for three Hanuman langur groups (*Semnopithecus entellus*) of different sizes. Data were collected between 1991 through 1996 at Ramnagar, southern Nepal during focal animal follows. Instantaneous samples were obtained on general activity and specifics of feeding behavior including plant species and part. Chemical analysis of nutritional content together with individual ingestion rates and feeding times