Supplement to *Paleopathology Newsletter*

PALEOPATHOLOGY ASSOCIATION

SCIENTIFIC PROGRAM
THIRTY-SECOND ANNUAL MEETING
(North America)

5 and 6 April, 2005

MILWAUKEE, WISCONSIN

PALEOPATHOLOGY ASSOCIATION
32nd Annual North America Meeting
April 5th and 6th 2005
Milwaukee, Wisconsin

SCIENTIFIC PROGRAM

TUESDAY APRIL 5TH

Morning Session (9am to 12 noon)

Workshop 1	Workshop 17: Tumors (Don Ortner and Bruce Ragsdale)
Workshop 2	Archeoparasitology and Paleopathology (Karl Reinhard and Elizabeth Martinson)

12-1.30pm: LUNCH: Let's Do Lunch (Mo's Cucina, 717 N. Plankinton Avenue)

Afternoon Session I (1.30pm to 3.20pm) – Chair: Dr. Tina Jakob

1.30pm	Announcements and session opening
1.40pm	Bruce Ragsdale - The Lessons From Large Slides
2.10pm	M. Schultz, T.H. Schmidt-Schultz, J. Gresky, K. Kreutz and M. Berner –
The People	from Basta And Ba'ja and Their Health in The Late PPNB In
Jordan	
2.30pm	Piers D. Mitchell - A Comparison of Child Health in a Medieval Farming
Village	and a Castle in the Crusader Kingdom of Jerusalem -
2.50pm	Charlotte Y. Henderson - Measuring Rotator Cuff Disease *
3.10pm	Kristin E. Horner - Prevalence of External Auditory Exostoses Among the Wishram and Wasco Tribes of the Columbia River Valley *

3.30pm **Break for Refreshments**

Afternoon Session II (3.50pm to 4.50pm) – Chair: Dr Piers Mitchell

3.50pm	Rachel Ives - Vitamin D Deficiency Osteomalacia in a Historic Urban
Collection.	Investigation of Age, Sex and Lifestyle-Related Variables *
4.30pm	S. Mays, M. Brickley and R. Ives - Vitamin D Deficiency in Children
from an	Urban and a Rural Environment
4.50	Close of Session

5.30-7.00pm Cocktails (Cash Bar)

WEDNESDAY APRIL 6TH

Morning Session (7.45am To 11.40am) – Chair: Dr Megan Brickley

8.50am Announcements
9.00am Nick Lonergan and Denise Hodges - A Probable Case of Scurvy in a Mississippian Population From Central Illinois
9.20am Tina Jakob - Interpretations of Periosteal New Bone Formation – An Example from Early Medieval England and Germany
9.40am A.K. Wilbur and A.W. Farnbach - Sensitivity of PCR Assays for Detection of *Mycobacterium Tuberculosis*: Implications for Ancient Disease Studies *

10.00am **Break for Refreshments**

10.20am- 12 Noon Poster Session (authors to be present with their posters during this time for questions)

12-1.30pm PPA Student Action Committee - Annual Meeting

Afternoon Session I (1.30pm To 3.20pm) – Chair: Dr Mary Lewis

1.30pm Shane Walker and Lynn Kilgore - Tuberculosis or Vascular Channels?
2.00pm W. Pestle and M. Colvard - Brucellosis in Middle Woodland Illinois
2.20pm Renata J Henneberg and Denis Ponomarev - Facial Injury from Byzantine Chersonesos (Crimea, Ukraine), 12^{th}-13^{th} Century AD
2.50pm Sandra M. Wheeler, Patrick Beauchesne, and El Molto - Broken Bones: a Possible Case of Child Abuse from Ancient Egypt
3.10pm James Gosman - Most Falls Occur at Home: A Bio-Architectural Study

3.20pm **BREAK FOR REFRESHMENTS**

Afternoon Session II (3.40-4.40pm) – Chair: Dr Simon Mays

4.00pm M.E. Lewis and R. Gowland - Infantile Cortical Hyperostosis: Cases, Causes, Constraints
4.20pm Tori D. Heflin - Temporal Bone Disease and Anomalies in the San Diego Museum of Man's Hrdlicka Collection from Peru
4.40pm Business Meeting, Announcement of 2005 Cockburn Student Award and Cockburn Service Award, Closing Remarks (Crystal Ballroom)
6.00pm Close of Meeting

*** = Entry for the Cockburn Student Prize**

ABSTRACTS

SECTION 1: WORKSHOPS

DIFFERENTIAL DIAGNOSIS IN SKELETAL DISEASE (XVII): BONE TUMORS

Donald J. Ortner, Smithsonian Institution, and Bruce D. Ragsdale, Arizona State University, USA

Bone tumors are classified as benign or malignant and also whether or not the tumor originates in or on the bone (primary) or metastasizes to bone from another tumor site (secondary). Benign tumors are typically not a significant cause of morbidity or mortality. However, they can kill the patient as, for example, a meningioma of the cranial base where the tumor interferes with the vascular supply of the brain and can disrupt nerve supply to the face with blindness and other complications. In other locations, benign tumors can debilitate (as with impingement on the spinal cord or pathologic fracture) and can also undergo malignant transformation. Malignant bone tumors can kill by metabolic inanition (exhaustion or lack of vigor) or by metastatic compromise of distant organ function. Obviously the severity of bone tumor morbidity varies depending on the tumor subtype, location and host factors.

Primary malignant tumors of bone are sarcomas. Malignant tumors metastatic to bone ("secondary bone tumors") may be carcinomas if they originate in the epithelium of an organ (e.g. carcinoma of the colon carcinoma), or sarcomas of extraskeletal origin (e.g. intestinal wall leiomyosarcoma). Primary skeletal sarcomas can spread by the blood stream to other bone sites as well causing polyostotic disease. Neoplasms may start in the bone marrow, the home of the immune and hematopoietic systems. These too are "primary" bone tumors (e.g. lymphoma of bone, leukemia and plasmacytoma/multiple myeloma).

When confronted with a specific case, the first objective of the skeletal paleopathologist is to distinguish a true tumor (neoplasm) from something resulting from one of the other basic categories of bone disease (e.g., infection, trauma). In a modern clinical setting the confident specific diagnosis of bone tumors is achieved through careful evaluation of patient history, radiographs and histologic study of an adequate biopsy. Lacking one or more of these variables incumbers diagnosis in the present day. Clearly the paleopathologist will never have all three and so is at a distinct disadvantage (few ancient burials will have associated written records or histological slides.) This advises not being too specific unless there is unambiguous supportive evidence.

With relatively complete skeletons one can determine the location(s) of a bone lesion(s) within a skeleton that exhibits evidence of neoplasia. With radiography, more than surface characteristics of the lesion(s) can be evaluated, i.e. an organized morphologic analysis of the three parameters - margins, periosteal reactions, and matrix patterns. In the modern clinical setting, radiographic features of some tumors are so distinctive that diagnosis is virtually certain from that alone. For example, the honeycomb, spoke-wheel, and corduroy cloth alterations around hemangiomas; the lobulated sclerotic border around an eccentric radiolucent metaphyseal fibroxanthoma (nonossifying fibroma); the stippled, flocculent or ring-and-arc matrix patterns of enchondroma; the hair-on-end dense proliferation in the calvarium stimulated by invasive meningioma, etc. Fortunately, radiographs and CT images of paleopathological skeletons can provide similarly useful information. Careful direct evaluation of the specimen and its radiographic images greatly reduces the diagnostic possibilities within the broad general categories of disease. Often, radiographic location and configuration can be the deciding evidence between alternatives. A common initial decision to be made is bone vs. soft tissue origin. Encompassing periosteal

reactions, such as bony shells, connote a bone tumor but, when absent, details of the cortical destruction can favor extrinsic invasion or, alternatively, break out. Saucerization of the cortex with or without bordering interrupted reactions favors malignant soft tissue tumors. The decision is easy when there are distinct mineralization patterns at the intramedullary epicenter (bone tumor) or parallel effects on adjacent bones due to impingement (soft tissue tumor). Soft tissue masses within a joint or adjacent to a joint area may secondarily involve the bony structures and mimic a bone tumor.

Judgments as to whether a lesion is benign or malignant often are tempered and can be dictated by the radiologic findings. One should be cautious in venturing a malignant diagnosis when the lesion is small. The obverse is not valid; in the mesenchymal system, large size alone does not force a malignant interpretation. The roentgen patterns of extremely early tumors are not so identifiable as those that are more advanced, because the cortical erosion and periosteal reaction, so important in identification of tumor type and growth characteristics, are not yet developed. The radiographic patterns of extremely overgrown tumors are likewise difficult to identify because the initially-present, characteristic reactions of the cortex and periosteum can be obliterated by a large soft tissue extension and even the complete destruction of bone. Anatomical and radiographic characteristics of tumor lesions reflect altered regional blood flow that tells much about the biologic potential of the tumor. In some instances, the correct specific diagnosis is dependent on purely radiographic information, such as distribution. Multiple radiographically similar lesions may permit a special diagnostic term acknowledging polyostotic distribution (e.g. angiomatosis, Ollier's, hereditary exostoses) or characteristic distribution in a single limb (cortical fibrous dysplasia).

Statistical frequency, age of peak incidence, and sexual predilection are of secondary diagnostic importance with solitary bone lesions. Rather than the initial consideration, these should be used to refine (rank in likelihood) a differential diagnosis based on careful morphologic analysis. The reality is that there are many bone tumors where a specific diagnosis is not possible, particularly in an archeological human burial. Remember that medical textbook depictions of "classic appearances" are those at presentation for treatment while the same lesions should be expected to manifest their full natural growth potential in antiquity. A subtheme throughout this workshop is proper descriptive word choice; many terms and expressions commonly used in the medical literature (e.g. "bone expansion") are best avoided since they obscure or misrepresent disease mechanisms.

ARCHAEOPARASITOLOGY AND PALEOPATHOLOGY

Karl Reinhard, University of Nebraska, and Elizabeth Martinson, JPAC/CIL, USA

Archaeoparasitology is a field that combines parasitological diagnosis with archaeological methods to reconstruct passed environments of disease transmission. This endeavor has specific relevance to paleopathologists looking for explanations of osteological abnormalities. This workshop presents diagnostic procedures based on clinical slides and archaeological specimens. The archaeological specimens include archaeological sediment samples and intestinal residues from mummies and skeletons. A series of posters presents the archaeoparasitological interpretations of several key discoveries that have come from archaeoparasitology. These include a general overview of New World evidence of parasites, the pathoecology of cave life and Chagas disease in Mexico and Brazil, and the contrast of parasitic disease between hunter-gatherers and horticulturalists in the Southwest USA and central Andes. Historic

archaeoparasitology will be represented by posters describing the rise and control of parasitic disease in Albany, New York between 1780 and 1920 and the nature of parasitism in America´s most notorious slum, the Five Points site. Finally, the workshop presents specific situations in which parasitic data shed light on osteological manifestations. These include the influence of common parasites on maternal/infant anemia, stature, the relation of louse infestation to periostitis, how parasites are responsible for abnormal calcifications, and identification of facial disfigurement due to protozoa infections. Ultimately, the workshop will provide participants with an overview of 25 years of research with highlights of key discoveries and current lines of research.

SECTION 2: CONTRIBUTED PAPERS

MOST FALLS OCCUR AT HOME: A BIO-ARCHITECTURAL STUDY. James Gosman, Ohio State University, USA

This study is a preliminary exploration of the spatial dimensions of bioarchaeology examining the relationship between domestic housing architectural style and the anatomical pattern of accidental long bone fractures. The hypothesis to be tested is that there is an identifiable fracture pattern in ancient populations living in defensive-style houses characterized by rooftop ladder access; a higher prevalence of fractures of the humerus, radius, and femoral shaft is expected compared to those populations not requiring ladder entry access. The goals of this project are to integrate skeletal data, architectural data from domestic dwellings, and the broader anthropological concerns of built space in a comparative study of skeletal remains from Catalhoyuk (6200-5839 BC), Classical Greece (650-300 BC), Late Christian and Early Christian Nubia (240 BC-1770 AD and 550-750 AD, respectively), and Pecos Pueblo (1250-1838 AD), and the Santa Clara Valley (240 BC- 1770 AD).

Skeletal data are derived from published reports of human remains and comparison populations living in the same or similar regions in conventional domestic dwellings without ladder entry. The architectural aspects of housing style are based on published excavation findings and Reconstructions. Statistical analysis consists of fracture prevalence, patterns, and statistical pairwise comparison using Pearson's Chi-square test. The Pecos Pueblo/Santa Clara Valley comparison is the only pair to reach statistical significance (p=.0001) for the humerus/radius/femur fracture pattern. This project is envisioned as part of a broader examination of the spatial aspects of fractures in ancient populations. Future directions will include expansion of the architecture theme with additional and/or new skeletal data and sites, and the exploration of the usefulness of GIS digital terrain modeling in understanding the topographic components of accidental fracture risk.

TEMPORAL BONE DISEASE AND ANOMALIES IN THE SAN DIEGO MUSEUM OF MAN'S HRDLIČKA COLLECTION FROM PERU. Tori D. Heflin, San Diego Museum of Man, USA

The Hrdlička Collection, housed at the San Diego Museum of Man, was assembled by Aleš Hrdlička for the 1915 California-Panama Exposition, and is comprised of skeletal remains displaying various pathological conditions. The majority of the skeletal remains in this collection was amassed in Peru, as they were accumulated from looted gravesites. Paleopathological evidence of temporally bone disease in the Hrdlička collection was visually observed and

documented. However, in addition there was a broad range of temporal bone disease and anomalies, such as tympanic dehiscence, cholesteatoma, and a newly discovered anomaly. When the 'new anomaly' was discovered, it was thought to have something to do with auditory exostosis. As a result, radiographs were taken of a random selection of skulls displaying auditory exostosis. However the 'new anomaly' was not found in any of the other skulls.

MEASURING ROTATOR CUFF DISEASE*. Charlotte Y. Henderson, University of Durham, UK

The aim of this study was to consider the causes of changes at the insertion of the rotator cuff tendons. These changes take the form of lytic defects, the formation of bone spurs (often recognised as musculoskeletal stress markers) or reduction in insertion size. However, musculoskeletal stress is not the only factor involved. Others are: age, anatomical variants and hypovascularity. The material used is a collection of adult mediaeval humeri from Northeast England. The rotator cuff insertions were measured using a digital sliding caliper and assessed for changes from the normally smooth surfaces. Statistical comparisons were performed between normal and abnormal surface measurements. Significant differences were found between the normal and abnormal insertion sizes for many of the measurements. It is unknown whether size differences are the cause of the abnormality or the result of it (Ruotolo *et al.* 2004). In general, the cause of the abnormality cannot be directly attributed to musculoskeletal stress. Too many factors are involved. However, one cause of lytic defects might be osteochondral fractures, which are fractures in subchondral bone (Bui-Mansfield 2002). Commonly these occur on articular epiphyses, and are called osteochondritis dissecans. The insertions of the rotator cuff tendons are covered in fibrocartilage, whose tidemark is continuous with that of the hyaline cartilage covering the humeral head. Consequently, similar processes probably predispose these zones to fractures. The causes of this predisposition are disputed; consequently, recognition of them is, currently, of limited value.

References

Bui-Mansfield, L. T. 2002 *Osteochondritis Dissecans, EMedicine.* Accessed 2004. www. emedicine. com / radio/ topic495.htm

Ruotolo, C., Fow, J.E. and Nottage, W.M. 2004) The Supraspinatus Footprint: An Anatomic Study of the Supraspinatus Insertion. *Arthroscopy* 20(3): 246-249.

FACIAL INJURY FROM BYZANTINE CHERSONESOS (CRIMEA, UKRAINE, 12TH-13TH CENTURY AD. Renata J Henneberg, University of Adelaide, Australia, and Denis Ponomarev, National Preserve of Tauric Chersonesos, Ukraine

Extensive changes to the left side of the face of a 35-40 years old male are described. The skeleton was recovered from a stone tomb with multiple burials located in the Byzantine church in the city of Chersonesos. The individual suffered a trauma to the left maxilla, probably inflicted with an arrow. The impact fragmented the left maxillary bone in its central part. The lateral and medial wall of the orbit and the left wall of the nasal cavity were fractured. The frontal process of the left zygomatic bone and the left zygomaticomaxillary suture were affected. The injured person recovered and the affected bones partially repaired with thin layers of bone tissue with openings in them, the largest opening being a vertical fissure across the most of the anterior surface of the maxilla. Large calculus deposits accumulated on all lower left molar teeth. Abscesses formed around left maxillary molars, which were probably lost due to the inflammatory process. The thin layer of bone surrounding the maxillary sinus was destroyed. It is

suggested that the mandibular division of the left trigeminal nerve controlling the muscles of mastication was injured leaving the left side of the face paralysed. The injury could also have affected affect nerves supplying the parotid gland, reducing saliva flow at the left side.

Financial support of Packard Humanities Institute is acknowledged.

PREVALENCE OF EXTERNAL AUDITORY EXOSTOSES AMONG THE WISHRAM AND WASCO TRIBES OF THE COLUMBIA RIVER VALLEY*. Kristin E. Horner, Arizona State University, USA (Co-winner, Cockburn Student Award 2005)

The purposes of this study were to review existing literature regarding the formation of external auditory exostoses in past and present populations, clarify the definition of external auditory exostoses, evaluate the prevalence and severity of this pathology in the Wishram and Wasco tribes, and to examine the implications of the findings. One hundred and fifty-one adult skulls were examined and exostoses were graded to reflect severity. The overall frequency of exostoses in the population was found to be 31.8%, with a frequency of 46.6% in males and 17.9% in females. No evidence of exostoses was found in the thirty sub adult skulls examined. It was found that males more frequently have bilateral, multiple, and more severe exostoses than females. In addition, multiple exostoses are more often bilateral and more severe. Overall, most of the exostoses in the sample were mild and bilateral, occurring on the posteroinferior or anterosuperior aspect of the ear canal. These findings are consistent with a subsistence pattern involving a heavy reliance upon fish from the Columbia River with men doing much of the fishing.

VITAMIN D DEFICIENCY OSTEOMALACIA IN A HISTORIC URBAN COLLECTION. INVESTIGATION OF AGE, SEX AND LIFESTYLE-RELATED VARIABLES*. Rachel Ives, University of Birmingham, England (Co-winner, Cockburn Student Award 2005)

Insufficient exposure to sunlight and inadequate dietary intake results in vitamin D deficiency. In adults this deficiency causes a failure of bone matrix to mineralise, recognisable archaeologically as multiple fractures at specific locations. Little is known of the presence of vitamin D deficiency in adults (osteomalacia) from the historic period in Britain. Increased recognition of this metabolic bone disease will contribute significantly to understanding the impact of lifestyle and diet on adult health in the past. This research aimed to use recently developed criteria for the identification of vitamin D deficiency from skeletal remains (Brickley et al. in press; Brickley et al. 2004) to establish the prevalence of osteomalacia in a historic urban cemetery from London, England.

Two hundred and sixty-three individuals from the known-age-at-death skeletal collection from Christ Church, Spitalfields, London, were examined for stress fractures at specific skeletal sites including scapulae, ribs, vertebrae, pelves and long bones. Analysis comprised macroscopic, radiological and microscopic (back-scattered SEM imaging) evaluation. Initial results have confirmed four adults affected by active vitamin D deficiency. Three new manifestations of the disease are presented and these expand the criteria developed by Brickley et al. (2004). Discussion of these cases considers the influence of age, sex, multiple pregnancies and socio-economic status on disease presence. The results form part of on-going research into metabolic disease presence between different socio-economic urban classes from the historic period in Britain.

References

Brickley, M., Mays, S., and Ives, R. (in press) Skeletal Manifestations of Vitamin D Deficiency in Documented Historical Collections. *International Journal of Osteoarchaeology.*

Brickley, M., Mays, S., and Ives, R. 2004 An Investigation of the Range of Skeletal Indicators of Vitamin D Deficiency in Adults and Juveniles. *American Journal of Physical Anthropology* 123 (S38) Abstract: 61.

INTERPRETATIONS OF NON-SPECIFIC INFECTIOUS DISEASE –AN EXAMPLE FROM EARLY MEDIEVAL ENGLAND AND GERMANY

Tina Jakob, University of Durham, England

Numerous examples of new bone formation are presented in the palaeopathological literature, with a focus on it occurring on the lower leg bones. Despite its common occurrence, causative factors of periosteal new bone formation found in archaeological human remains are yet ill understood, and assume either an inflammatory and/or traumatic aetiology. However, an epidemiological evaluation remains problematic since this change may be part of a specific infection such as tuberculosis, leprosy and treponemal disease (Roberts, 2000). This paper aims to analyse and compare macroscopic evidence of lower leg new bone formation in a biocultural context. The skeletal material studied derives from several Early Medieval populations (mid-5th to early 8th centuries AD) from Britain and southwestern Germany. With a prevalence of 15% (21 of 137 British individuals) and 28% (46 of 163 German individuals), respectively, differences in tibial new bone formation between the two countries were statistically significant (χ=7.1329, p=0.0076, d.f.=1). The same predominance of periosteal new bone formation in German samples was observed with regard to the number of tibiae preserved (9%, or 29 of 309 British tibiae; 16%, or 60 of 361 German tibiae). In both countries, subadults were not affected, while more males than females displayed periosteal reactions of their lower leg bones. A traumatic origin for at least some of these lesions can be assumed, since German males also showed high prevalence rates for lower leg fractures, but additional interpretations such as non-specific infection due to environmental factors have to be addressed.

Reference

Roberts, C. 2000 Infectious disease in biocultural perspective: past, present and future work in Britain. In: *Human Osteology in Archaeology and Forensic Science,* M. Cox and S. Mays (eds), pp. 145-162. London: Greenwich Medical Media Ltd.

INFANTILE CORTICAL HYPEROSTOSIS: CASES, CAUSES, CONSTRAINTS. Mary Lewis, University of Reading, England and Rebecca Gowland, University of Cambridge, England

Infantile cortical hyperostosis (ICH) or Caffey's disease was first described in 1945 and denotes a triad of lesions comprising soft tissue swelling over an inflamed periosteum, irritability and bone lesions. The condition has both a familial and sporadic aetiology, heals spontaneously and has its onset and resolution in infancy. Skeletal lesions include layers of subperiosteal bone formation and cortical thickening of the long bones, with the tibia most frequently affected, and the mandible most commonly affected in the sporadic form of the disease. Several case of ICH has been reported in the palaeopathological literature, but the aetiology of this condition is still unknown. Modern cases are thought to result from a latent infection, genetic defect, arterial abnormality or an allergic reaction. This paper will discuss the diagnostic criteria and differential

diagnoses for the condition in an attempt to explain skeletal changes in ten infants from the Romano-British sites of Poundbury and Stanton Field (AD 43-410).

A PROBABLE CASE OF SCURVY IN A MISSISSIPPIAN POPULATION FROM CENTRAL ILLINOIS. Nick Lonergan and Denise Hodges, Northern Illinois University, USA

This paper describes a probable case of scurvy in a young individual (2 to 4 years old) from the Weaver site in Fulton County, Illinois. The Weaver skeletal collection, curated at the Illinois State Museum, contains a minimum of 33 individuals recovered from Hopewell and Mississippian occupations (100 BC-400 AD and AD 1000-1300, respectively)). There are 19 adult individuals and 14 subadults. During a general study of health indicators in the sample by the senior author, what appeared to be an extreme case of porotic hyperostosis in a young child, burial F228-72 from the Mississippian period, was identified. The skeleton was incomplete consisting primarily of cranial bones including the parietals, frontal, part of the occipital, one of the temporals, and parts of the maxillae and mandible. The parietal bones display extensive bone deposition on the external surface similar to porotic hyperostosis. Bone deposition was also present on the maxilla, mandible, occipital and nasal bones. The pattern of the lesions and a differential diagnosis, including scurvy, are discussed

VITAMIN D DEFICIENCY IN CHILDREN FROM AN URBAN AND A RURAL ENVIRONMENT. Simon Mays, Ancient Monuments Laboratory, English Heritage Centre for Archaeology, England, Megan Brickley and Rachel Ives, University of Birmingham, England

The aim of this paper is to compare the frequency and skeletal manifestations of rickets in immature individuals from an urban, industrial population with those in a rural agrarian community. The urban group comes from a 19th century AD burial ground in Birmingham, England. The rural group comes from the deserted Mediaeval village of Wharram Percy. Lesions due to rickets were identified using gross examination and scanning electron microscopy. Results indicate that the prevalence of rickets was greater in the urban group. In the urban population, both active and healed cases were identified whereas all the rural cases of rickets were active at time of death. In addition, bone changes reflecting the direct effects of vitamin D deficiency were less severe in the cases of rickets from the urban group than they were in the cases of the disease identified in the rural population. Possible reasons for these inter-population differences are discussed. We conclude that a more fine-grained understanding of vitamin D deficiency in past populations may potentially be gained if careful inter-population comparisons are made not only of the frequency of rickets but also of the severity and patterning of lesions in the skeleton.

A COMPARISON OF CHILD HEALTH IN A MEDIEVAL FARMING VILLAGE AND A CASTLE IN THE CRUSADER KINGDOM OF JERUSALEM. Piers D. Mitchell, Imperial College, London, U.K.

This paper attempts to determine how lifestyle and environment affected child health in the medieval Middle East, at the time of the crusades. This is important as most published studies of health in past populations have concentrated on the paleopathology of adults, and children have often been neglected. Evidence for health in immature human skeletal remains excavated from the 12-13th century farming village of Le Petit Gérin was compared with published evidence from

the 12th century crusader castle of Castellum Vallis Moysis, and also with the much earlier Bronze Age series of Ikiz Tepe in Anatolia.

The age at death profile in the children from each site was similar to that of the poorest modern developing world countries. The typical pattern is many deaths around birth, a moderate number of deaths up to the age of five years, and a comparatively low number of deaths in older children. Study of pediatric research in modern developing world populations allows us to suggest which types of disease may have been responsible for deaths in the different age groups excavated. Comparison between the three sites was striking. At the castle site 60% of those who died in childhood died either premature or around birth. In the farming village 60% of child deaths had occurred by the age of 1 year. In the Bronze Age site it was only by the age of 5 years that 60% of the child deaths had occurred. Nonspecific indicators of ill health (dental enamel hypoplasia, cribra orbitalia, long bone periostosis and intracranial periostosis) were also compared between the three sites. Prevalence of indicators was very similar at the farming village and Bronze Age site, but higher at the castle.

Interpretation of such data requires us to bear in mind the osteological paradox and also the potential effects of variable fertility between sites. However, it seems clear that health was not the same in the three populations. My interpretation of the data is that health amongst the children at the farming village was probably better than the children at the crusader castle, but probably worse than at the Bronze Age site.

BRUCELLOSIS IN MIDDLE WOODLAND ILLINOIS. William Pestle, Field Museum of Natural History, Chicago, and Michael Colvard, University of Illinois, Chicago, USA

The 1986 discovery of an assemblage of nearly 2000-year-old skeletal remains in Romeoville, southwest of Chicago, Illinois (11WI1186) has provided archaeologists and physical anthropologists with a unique opportunity to study the bio-cultural interface of health and disease among individuals living at the northwestern periphery of the Hopewell interaction sphere. Osteological examination of the commingled Romeoville remains has revealed three lumbar vertebrae exhibiting apparent lesions of vertebral brucellosis, the presence of which would be noteworthy given the paucity of domesticated animals, the most common vectors for human brucellosis in the Middle Woodland period of Illinois' prehistory. The present work includes the detailed characterization of the vertebrae in question, discussion of the differential diagnosis for the observed lesions, an examination of the pre-contact distribution of the species of the genus *Brucella* in North America, and an attempt to provide possible explanations for the observed human case(s) of brucellosis. It is hoped that the combined lines of cultural, epidemiological, and archaeological evidence will yield novel insights into both the nature of disease and health in the Middle Woodland period of the American Midwest and the prehistoric biogeography of the genus *Brucella*.

LESSONS FROM LARGE SLIDES

Bruce D. Ragsdale, Arizona State University, USA

The central problem in paleopathology is the identification of diseases in osteological remains. If pathology is be used to determine quality of life in extinct populations, diagnostic accuracy is paramount. Many volumes describe the visual and radiographic appearance of diseases in dry bone. However, little attention is given to methods for resolving the problem of distinguishing between competing diagnoses. As a result, the tested competency of in-training and professional paleopathologists, and amateurs, has not been terribly impressive (Miller *et al*., 1996).

Whichever of the Seven Basic Categories of Disease are manifest, pathologic modification of the skeleton is induced by only three influences - circulation, metabolic factors, and mechanical stress. Inherent remodeling and reparative mechanisms respond to preserve optimal functional integrity, and of course Wolff's Law is relevant here. However, these influences operate in variable proportions in every disease state. The celloidin technique for the study of whole brain sections was pioneered in Europe. However, it was Lent Johnson, M.D. at the Armed Forces Institute of Pathology, who adapted it to paraffin and large scale bone studies. The result was the clarification of three influences on bone remodelling, as expressed above.

This presentation will build on Ragsdale (1993), and hopefully stimulate an understanding that only two cell types operate in variable proportions in every disease state, and assess their contribution to classify skeletal changes to one of the Seven Categories of disease. Besides by organizing your methodology, these and a few other basic principles are the route to understanding structural changes in diseased bone and arriving at something other than an inappropriate diagnosis.

References

Miller, E., Ragsdale, B.D., Ortner, D.J. 1996 Accuracy in dry bone diagnosis: a comment on paleopathological methods. *Int. J. Osteoarchaeology* 6:221-229, 1996.

Ragsdale, B.D. 1993 Morphologic analysis of skeletal lesions: correlation of imaging studies and pathologic findings. In *Advances in Pathology and Laboratory Medicine*, Mosby, Chicago, Vol. 6, pp.445-490.

THE PEOPLE FROM BASTA AND BA'JA AND THEIR HEALTH IN THE LATE PPNB IN JORDAN. Michael Schultz, Tyede Schmidt-Schultz, Julia Gresky, University of Göttingen, Germany, Kerstin Kreutz, University of Hildesheim, Germany, and Margit Berner, Museum of Natural History, Vienna, Austria

The etiology and the epidemiology of diseases and the mortality of Late PPNB populations from Jordan were investigated. Skeletal remains from the Late PPNB (7500-6900 BC cal.) settlements of Basta (56 individuals) and Ba'ja (12 individuals) were examined by macroscopic, radiological, endoscopic, light and scanning-electron microscopic, and biochemical techniques (Berner and Schultz 2005; Schultz 1987, 2005; Schultz and Scherer 1991).

In the population from Basta, cut marks suggest a particular mortuary practice. In the skulls, no intentional intra vitam deformation was observed. There is a relatively high frequency of healed skull trauma. In one, possibly in two cases, there is evidence of an intra vitam surgical event representing the oldest known skull operation to date. Non-specific stress indicators such as cribra orbitalia, transverse linear enamel hypoplasia, Harris's lines and periosteal reactions were diagnosed. Vestiges of deficiency diseases such as scurvy and anemia, and inflammatory processes such as meningeal reactions, frontal and maxillary sinusitis were found. Oral hygiene was poor, suggesting the Basta people suffered from inflammatory diseases of the periodontium. Dental caries was rare, and the frequency of osteoarthritis was relatively low (Schultz et al. 2004). The population from Ba'ja shows a similar pattern of frequencies of diseases as the Basta population. In summary, the frequency of disease in the Late PPNB populations from Jordan were relatively low in comparison to other prehistoric populations.

References

Berner, M and Schultz, M. 2005 Demographic and taphonomic aspects of the skeletons from the Late Pre-pottery Neolithic B Population from Basta (Jordan). In H.D. Bienert, H.J.K. Gebel and R. Neef (eds): *Central settlements in neolithic Jordan. Studies in early Near Eastern production, subsistence and environment*. Berlin, Ex Oriente, pp.195-208.

Schultz, M. 1987 The human skeletal remains. In H.J. Nissen, M. Muheisen, and H.G. Gebel (eds): Report on the two seasons of excavations at Basta (1986-1987). *Annual of the Department of Antiquities of Jordan* 31:96-97.

Schultz, M. and Scherer, A. 1991 The human skeletal remains. In H.J.Nissen, M. Muheisen and H.G. Gebel (eds): Report on the excavations at Basta 1988. *Annual of the Department of Antiquities of Jordan* 35:18-19.

Schultz, M., Schmidt-Schultz, T.H., Gresky, J., Kreutz, .K. and Berner, M. 2004 Die Menschen von Basta und Ba'ja im akeramischen Neolithikum. In B. Salje, N. Riedl and G. Schauerte (eds): *Gesichter des Orients*. Mainz, Verlag Philipp von Zabern, pp. 57-60.

Schultz, M., Schmidt-Schultz, T.H. and Berner, M. 2005 Preliminary Results on Morbidity and Mortality in the Late PPNB Population from Basta (Jordan). In H.D. Bienert, H.J.K. Gebel and R. Neef (eds): *Central settlements in neolithic Jordan. Studies in early Near Eastern production, subsistence and environment*. Berlin, Ex Oriente, pp.187-193.

TUBERCULOSIS OR VASCULAR CHANNELS? Shane Walker, University of Colorado and Lynn Kilgore, Colorado State University, USA

It has been suggested that the presence of pitting on anterolateral surfaces of subadult vertebral bodies may be evidence of tuberculosis. In this study we examined 91 well-preserved, subadult vertebral columns from the Christian Period Nubian site of Kulubnarti. The study sample included individuals with an estimated age at death of 3 to 18 years. Of these, 66 percent exhibited moderate to pronounced pitting along anterolateral vertebral body surfaces. Pitting was most prevalent in thoracic vertebrae and, to a lesser extent, in the lumbar spine. It was more common on anterior surfaces but also visible laterally, especially in lumbar elements. A review of the pediatric and developmental orthopedic literature revealed that these openings are normal vascular channels in subadults that usually disappear by the late teens. They are remnants of the embryonic sclerotomal resegmentation process, during which the embryonic intersegmental artery is incorporated into the vertebral centrum. In view of the fact that there is no visible evidence of tuberculosis in the Kulubnarti adults, the relatively high proportion of involved subadults in the Kulubnarti collection support the conclusion that these openings are normal vascular channels and not evidence of tuberculosis.

BROKEN BONES: A POSSIBLE CASE OF CHILD ABUSE FROM ANCIENT EGYPT. Sandra M. Wheeler and Patrick Beauchesne, and El Molto, University of Western Ontario, Canada

Children have traditionally been neglected in physical anthropology, except in the context of quantifying children in demographic profiles. Our intent is to explore the lives of children, in the form of an osteobiography, as children are integral to every society. In 2003, the complete skeletal remains of a child were excavated from the Kellis II cemetery exhibiting skeletal fracture patterns consistent with chronic child abuse, which may or may not have led to the child's untimely death.

The Kellis II cemetery site is located in the Dakhleh Oasis, Egypt. It is thought to be a late Roman/early Christian cemetery (circa 100 to 350 A.D.). The skeletal remains are in an excellent state of preservation, typical of the population of Kellis II. Dental estimates place the age of the child at approximately three years. The individual exhibits complete bilateral fractures of the proximal humeri, with the early development of pseudoarthrosis on the left humerus. A complete fracture of the right clavicle is also present. Non-specific periostitis was observed on the scapulae, humeri, radii, ulnae, lower ribs and ilia. A bioarchaeological approach integrating paleohistology, paleopathology, archaeological evidence, medical imaging (microCT) and clinical data is used to investigate child abuse in this context. Results from these multiple lines of evidence parallel clinical patterns of skeletal trauma indicative of child abuse. This potential case of child abuse is placed within the larger context of the Kellis II cemetery.

SENSITIVITY OF PCR ASSAYS FOR DETECTION OF *MYCOBACTERIUM TUBERCULOSIS*: IMPLICATIONS FOR ANCIENT DISEASE STUDIES*. Alicia K. Wilbur and Amy W. Farnbach, University of New Mexico, USA

Following the first successful amplification of pathogen DNA from skeletal material in the early 1990s, increasing numbers of paleopathologists report successful amplification of *Mycobacterium tuberculosis*-complex DNA from ancient skeletal and mummified remains. Early work focused on amplification of the multiple copy insertion sequence *IS6110*, present in all members of the complex; subsequent studies report recovery of single copy loci that allow subspecific and strain characterization of the ancient pathogens. Critics of these studies, however, point to the difficulties inherent in recovery and amplification of degraded, scarce ancient molecules, and suspect that some of the "ancient" genes amplified are really the result of contamination with modern DNA. Indeed, very little work has been done to test the ability of PCR to detect *M. tuberculosis* DNA in skeletal samples of known TB status. We examined the sensitivity of PCR for amplification of both multi-copy and single-copy loci in a sample of *M. tuberculosis* DNA extracted from a cultured specimen. The sensitivity of primers for *IS6110*, *oxyR*, *katG* and other loci typically examined in recent published reports of ancient tuberculosis was tested using real-time quantitative PCR with starting concentrations of 12, 25, 50, 100, and 200 picograms of template DNA. Here we report our results, and discuss in detail the implications for recovery of ancient tuberculosis DNA.

SECTION 3: CONTRIBUTED POSTERS

IMAGING THE LEGEND OF MARIE O'DAY. Gerald Conlogue, Quinnipiac University, USA; Jeff Jones, Wilson Medical Center, USA; Ronald Beckett, Quinnipiac University, USA; Mark Biesinger, University of Western Ontario, Canada; and Larry Engel and Mary Olive Smith, Engel Brothers Inc., New York, USA

A comprehensive examination was undertaken on a sideshow mummy known as Marie O'Day. The objectives of the study were to substantiate or refute anecdotal information associated with the individual, presence of pathology and possible cause of death. The elaborate story associated with the mummy indicated she was a night club entertainer murdered in 1925, dumped into Utah's Great Salt Lake and washed ashore in 1937. Although the excellent state of preservation was attributed to the high salinity of the Lake, SEM/EDX analysis of the hair and skin sample indicated arsenic was an embalming agent. Due to the exceptional preservation, soft tissue shadows were demonstrated on conventional radiographs. Since post mortem changes may make

the determination of structures and pathologies difficult using two-dimensional radiographs, computed tomography (CT) was employed. Not only did the CT confirm the identity of organs, such as heart, liver and kidneys, but it also demonstrated a complex cavitation in the left lung suggestive of tuberculosis. In addition, the quantitative ability of CT was used to determine the densities of structures in the lungs and other tissues and CT guided biopsy was attempted to determine the origin of a possible lesion in the right lung. The value of correlating conventional radiographs and CT images in the examination of mummified remains are discussed.

THE IDENTIFICATION OF PAGET'S DISEASE IN A PREHISTORIC SPECIMEN FROM ONTARIO, CANADA. Janet Gardner, Patrick Beauchesne, and Michael Spence, University of Western Ontario, Canada

Skeletal remains were analyzed to assess pathological indicators for the presence of Paget's disease. The remains were found in a co-mingled, secondary burial context at the Skinner site in southwestern Ontario. The Skinner site is archaeologically associated with the Young Phase dated from 800-1200 A.D. Radiological examination of cranial and post-cranial elements was used to determine the presence of pathological bone. Abnormally thick and irregular bone identified in a cranial vault lead to histological studies on this element. Polarized light microscopy established the presence of Pagetic woven bone. The identification of Paget's disease in this specimen represents one of the extremely rare cases reported in the paleopathological literature and may well represent the earliest case of Paget's disease in the New World. Although the Lagua Santa specimen found in Brazil predates the Skinner specimen (Bryan, 1978), it is now reported as lost with only a macroscopic, visual differential diagnosis of Paget's disease and no histological conformation. .

Reference

Bryan, A.L. 1978 An Overview of Paleo-American Prehistory from a Circum-Pacific perspective. In: *Early Man in America from a Circum-Pacific Perspective,* A.L. Bryan (ed.), pp. 306-327. Edmonton: University of Alberta Press.

THE EUGENE BORING SKELETAL COLLECTION FROM INDIA AT THE SAN DIEGO MUSEUM OF MAN. Tori D. Heflin, San Diego Museum of Man, USA

The Museum of Man has received a large collection of human bone specimens which will be a valuable resource for research and teaching. It was used for thirty years by Professor Eugene Boring at Chaffey College in Southern California to teach anatomy. The collection was acquired by Professor Boring in the 1960s and 1970s from the late Dr. Thomas Zurich, a preparator for biological supply companies. Dr. Zurich processed thousands of skulls and skeletons from India in his Los Angeles laboratory. Whenever he found a pathological or anomalous specimen, he saved it for Professor Boring, because most biological supply companies wanted only normal specimens for teaching. When Dr. Zurich retired, he sold the remainder of his collection to Professor Boring. The collection includes 85 crania, one free-standing skeleton, several disarticulated skeletons, and about 2000 single post-cranial specimens. The crania have pathologies, numerous dental conditions, and various anomalies. The majority of the post-cranial material is normal. This poster illustrates the potential of the Collection for future research.

A SIMPLE METHOD OF CHARACTERISING THE SURFACE OF ENTHESES. Charlotte Y. Henderson and Andrew J. Gallant, University of Durham, England

The aim of this poster is to present a simple, objective, and repeatable method of characterising the surface topology of entheses (soft tissue attachments to bone). A metal profile gauge, commonly used to fit tiles around curved surfaces, was pressed against the surface of the enthesis (the enthesis was covered with a latex glove to avoid surface damage; tests were performed to check that this did not significantly affect results). The curve of the surface was drawn onto paper. This acted as a simple filter to smooth out the jagged edges of the profile gauge. The paper was scanned and each curve was digitised and analysed using a MATLAB program. Several parameters commonly used for roughness evaluation in engineering (Gadelmawla *et al.* 2002) were used to compare the curves and provide an objective assessment of their roughness. Each curve was compared with ones plotted using SCION Image software (Scion Corporation, Washington, D.C.: http://www.scioncorp.com/), which assesses the surface topography based on shadows.

The results indicate that the profile gauge plots were consistent with those produced using SCION image. The MATLAB program had the advantage of evaluating surface topography. Although the profile gauge's resolution was poor (each prong is *c.* 0.8mm wide) the overall assessment of curvature and macroscopic roughness was good. The surface roughness parameters were useful for comparing the surfaces and describing them mathematically. This method of comparing entheses has the advantages of being simple, cheap, objective and repeatable.

Reference
Gadelmawla, E. S., Koura, M.M., Maksoud, T.M.A., Elewa, I.M. and Soliman, H.H. 2002. Roughness parameters. *Journal of Materials Processing Technology* 123: 133-145.

BILATERAL TARSAL COALITION IN A SKELETON FROM THE GREEK COLONY OF METAPONTO (6TH-4TH CENTURY BC, SOUTHERN ITALY)

Renata Henneberg and Maciej Henneberg, University of Adelaide, Australia and Antonio DeSiena, Museo Archeologico Nationale di Metaponto, Italy

Tarsal coalitions occur between any of two or more tarsal bones and can be fibrous, cartilaginous or osseous. The coalitions are associated with peroneal spastic flat foot and their mode of inheritance is known. Their frequency reported in early clinical studies was below 1%, but could be higher due to one third to three quarters being asymptomatic. Recent studies on cadavers show a 13% frequency of this condition, suggesting microevolutionary increase (Rühli *et al.* 2003).

Only a handful of tarsal coalitions have been described in archaeological samples (Aufderheide and Rodríiguez-Martíin, 1998:75-76). A case of bilateral calcaneonavicular coalition of asymmetric expression in the 30 years old male from the site Pizzica in Metaponto is described. Skull fragments, long bones and most of the foot bones including both tali, calcanei, navicular bones, cuboids and cuneiforms are preserved. The right navicular is completely fused with the calcaneus from just anterior to sustentaculum tali to the lateral border of the navicular (union 25mm long in coronal plane). The anterior half of the talocalcaneal joint has an uneven surface and osteophytes along its anterolateral border. Radiographic examination confirms complete calcaneonavicular osseous union. The left calcaneus and navicular display evidence of cartilaginous tarsal coalition. Corresponding surfaces of the anterior calcaneus and the postero-inferior navicular are uneven, resembling the epiphyseal surfaces of juvenile long bones. Other joint surfaces of both tarsal bones appear normal.

References

Aufderheide, A.C. and Rodríguez-Martín, C. 1998 *The Cambridge Encyclopedia of Human Paleopathology*. Cambridge: Cambridge University Press.

Rühli, F.J., Solomon, L.B. and Henneberg, M. 2003 High prevalence of tarsal coalitions and tarsal joint variants in a recent cadaver sample and its possible significance. *Clinical Anatomy* 16:411-415.

TIME DEPTH FOR TREPONEMATOSIS IN THE PREHISTORIC AMERICAN SOUTHWEST. Rebecca J. Hill and Brenda J. Baker, Arizona State University, USA

A new case of treponemal infection is reported from AZ N:7:286 (ASM), a site excavated in 2003 by Soil Systems, Inc., in the Prescott Valley of central Arizona. Fifteen of the 29 burials, including that of the individual with treponematosis, are flexed and preceramic. Calibrated radiocarbon dates of A.D. 400-700 place these burials in the Formative period (Leonard in press), establishing this case as the oldest radiocarbon dated evidence of treponematosis in the region (cf. Baker and Armelagos 1988; Stodder 2005). The well-preserved skeleton of an adult female in her forties is the only individual from AZ N:7:286 (ASM) with evidence of treponematosis. Cranial lesions are absent. Infracranial involvement is extensive, affecting both clavicles and all long bones but the right humerus. Lesions are extensive, covering most of the shafts of the clavicles, ulnae, and fibulae, the distal halves of the femora, and over half of the tibial and radial shafts. The pathology ranges from nodes/expansions with plaques to diagnostic nodes/expansions with superficial cavitation, as defined by Hackett (1976). Superficial cavitations are found on five of the long bones. The two extant metacarpals of the left hand show evidence of dactylitis, although the two present from the right hand are not involved. The number of bones involved, pattern of involvement, and presence of diagnostic lesions, indicate a differential diagnosis of treponematosis.

References

Baker, B.J. and Armelagos, G.J. 1988 The origin and antiquity of syphilis. *Current Anthropology* 29:703-737.

Hackett, C.J. 1976. *Diagnostic Criteria of Syphilis,Yaws, and Treponarid (treponematoses) and of Some Other Diseases in Dry Bones*. Berlin: Springer-Verlag.

Leonard, BL. (in press) Conclusions and application of the research design. In: *DataRrecovery at 22 Sites in the Stoneridge Development, Prescott Valley, Yavapai County, Arizona*, B.L. Leonard and C.K. Robinson (eds). Soil Systems Publications in Archaeology No. 23.

Stodder, A.L.W. 2005. Treponemal disease in the prehistoric Southwest. In *The Myth of Syphilis: The Natural History of Treponematosis In North America*, M.L. Powell and D.C. Cook (eds), pp. 227-280. Gainesville: University Press of Florida.

THE FREQUENCY AND PATTERNS OF ENAMEL HYPOPLASIA IN A BRITISH MEDIEVAL SKELETAL POPULATION. Amanda Hitterman and Anne L. Grauer, Loyola University of Chicago, USA

The analysis of enamel hypoplasia provides insight into childhood health and environmental conditions. For many human skeletal populations, this information is vital towards understanding human history, especially in light of the archaeological bias which favors the preservation and recovery of adult skeletons. The excavation of the St. Helen-on-the-Walls, York cemetery yielded 1014 individuals, with approximately 25% of the population dying under the age of 15 years old.

Within the population, 370 individuals were recovered with teeth. Using the left mandibular canine, the most frequently recovered tooth in the population, results indicate that 81% (n=154) displayed at least one hypoplasia. Of the 96 mandibular canines associated with females, 73 (76%) displayed enamel hypoplasias, while 57 (85%) of the 67 mandibular canines associated with males displayed the lesions. Attempts to compare these data with those from other medieval populations are made as a means towards assessing whether conditions differed in medieval York from other areas of Britain.

SURGICAL TREATMENT OF A DEPRESSED CRANIAL FRACTURE IN A MEDIAEVAL PEASANT FROM ENGLAND. Simon Mays, Ancient Monuments Laboratory, English Heritage Centre for Archaeology, England

A possible example of surgical treatment of depressed fracture of the cranium is presented. The individual involved is a Mediaeval peasant from Wharram Percy. The burial dates from the 10th-11th century AD. The surgery appears to have involved the use of trepanation by the scraping technique. This case pre-dates the first Mediaeval documentary descriptions of similar operations to treat depressed fracture and shows that access to complex surgical treatment was not invariably the preserve of the wealthy in Mediaeval England.

THE RELATIONSHIP OF DIET AND DENTAL HEALTH DURING THE IRON AGE IN BOTSWANA AND ZAMBIA. Kimmarie A Murphy, Kenyon College, USA

Research on many contemporary and prehistoric populations shows a trend of increased dental disease with heightened reliance on domesticated cereals such as maize; however, there is still more work that needs to be done exploring the cariogenicity of Old World Domesticates like sorghum and millet. Evidence for diet and dental pathology were evaluated for several Iron Age populations (Ingombe Ilede, Isamu Pati, Kgaswe, Simbusenga, Taukome, Toutswe) from Southern Africa (date range AD 900-1500). Carbon and nitrogen stable isotopes from the above sites indicate that these populations were more heavily reliant on C4 plants (domesticates such as sorghum and millet) than on either C3 plants (legumes, fruits, etc) or animals products. The evidence from dental pathology, on the other hand, does not systematically support this heavy reliance on domestic cereals. Caries rates are very low (0-4%) in all but two of the above sites, with frequencies more comparable to values associated with foraging subsistence strategies. In contrast, the rates at Isamu Pati and Simbusenga are 12% and 15% respectively. Environmental and cultural practices are discussed as possible sources for the differences in dental health. This study emphasizes the need for further studies exploring the relationship of caries and diets dependent on Old World domesticates.

THE RELATIONSHIP BETWEEN RIB PERIOSTEAL LESIONS AND TUBERCULOSIS COMPLEX INFECTION
Jennifer Raff, Skye Chang, Frederika Kaestle, and Della Cook, Indiana University, USA

Periosteal lesions, especially vertebral lesions, have frequently been used as an indication of infection by members of the *Mycobacterium tuberculosis* complex in humans. Skeletal involvement, although common in only a small percentage of infected individuals, can serve as a useful marker of the presence of the tuberculosis complex within a population, and form the basis for further research, including genetic analysis. Recently, several authors have suggested a correlation between rib lesions and tuberculosis complex infection. This study tests the

hypothesis that rib lesions can serve as a marker for tuberculosis infection within the Mississippian Schild skeletal collection from West-Central Illinois. Ribs from adults and juveniles were examined for lesions indicative of infection, and affected individuals were subsequently tested for tuberculosis complex infection using ancient DNA. DNA was extracted from samples of ribs without lesions from each affected individual, and amplified with primers targeting the *IS6110* insertion element that is common to all members of the tuberculosis complex. Although it cannot discrimate among tuberculosis species, *IS6110* is present in multiple copies within their genomes, and is thus a useful marker for ancient DNA investigations. Our results support the use of rib lesions as a marker for tuberculosis infection within an individual. Additionally, we demonstrate that tuberculosis complex DNA can easily be recovered from ribs without lesions. We therefore recommend that an examination of ribs be incorporated into investigations for tuberculosis complex infection.

SEX AND HEALTH IN MEDIEVAL YORK*. Rosa Spencer, University of Durham, England

The aim of this research was to examine the overall health of adult men and women from Fishergate House, York, England, in order to uncover any differences that may exist between the sexes and the reasons for such a discrepancy. The cemetery of Fishergate House represents a late medieval parish cemetery (12^{th}-16^{th} centuries AD), and lies just south of St. Andrew's Monastery in York, England. Fifty-nine of the 244 skeletons that make up the assemblage were examined for general macroscopic health indicators such as metabolic disorders, fractures, specific and non-specific infection, neoplastic, joint and dental diseases. Only those skeletons with greater than 50% preservation were used so that as many indicators as possible could be examined. Twenty-one per cent of the 51 females and 23% of the 56 males were examined. The results show that females have a higher frequency of maxillary sinusitis and dental caries and males have a higher frequency of fractures, joint disease and vertebral osteoarthritis, but that both sexes are equally affected in terms of calculus, periodontal disease, periostitis, and anaemia. The findings are suggestive of a sexual division of labour for this population and the reasons for this are explored.

DEGENERATIVE JOINT DISEASE IN MEDIEVAL POPULATIONS FROM BRITAIN: EXPLORING THE EFFECTS OF SEX AND GENDER. Claire Stigler and Anne L. Grauer, Loyola University of Chicago, USA

Research into the frequency and patterns of degenerative joint disease (also referred to as osteoarthritis) in skeletal populations has provided insight into human behavior and social interaction. While direct causes of the skeletal condition remain debated, hypotheses concerning the impact of the condition on human populations and the recognition of variation between and within populations serve to elucidate the potential of this condition to answer questions about the past. Using macroscopic evaluation, the frequency and pattern of osteoarthritis in the late Medieval (12^{th}-16^{th} centuries AD) St. Helen-on-the-Walls skeletal population from York, England is compared to other medieval populations with sample sizes exceeding 50 individuals. The results indicate that 41% of individuals in the St. Helen-on-the-Walls population with recovered joint surfaces displayed signs of osteoarthritis, with the lumbar vertebrae (71%) and femoral/acetabular joint (52%) displaying the highest frequency. Both females (81%) and males (88%) in the population displayed high frequency rates. These patterns also appear, with some variation, in other medieval populations. The extent and possible causes of the similarities and differences are explored.

DIFFERENTIAL DIAGNOSIS OF VERTEBRAL LESIONS OBSERVED ON A LATE PRE-HISPANIC INDIVIDUAL RECOVERED FROM ILLIMO, LAMBAYEQUE VALLEY, PERU*. Daniel H. Temple, Ohio State University, USA, Haagen D. Klaus, Ohio State University and Museo Arqueológico Nacional, Brüning de Lambayeque, Peru and Marco Fernández and Carlos Wester, Museo Arqueológico Nacional, Brüning de Lambayeque, Peru.

Anthropologists are often presented with the notoriously ambiguous task of diagnosing infectious diseases in human skeletal remains under conditions or on individuals that disallow appropriate diagnostic protocols to be performed. These protocols require careful description and examination of lesions including adequate diagnostic comparisons and, at least, radiographic imaging. Descriptions of lesions in an adult male recovered from the Lambayeque Valley of northern Peru (Middle Sican Culture, AD 900-1100) are presented here to illustrate a case where it is appropriate to err on the side of caution by offering a tentative diagnostic opinion.

Well circumscribed lytic lesions were found on the bodies of the tenth through twelfth thoracic vertebra. Some reactive bone was macroscopically observed around the lesion margins. Mild periosteal inflammation was noted around the bodies of the first lumbar and tenth thoracic vertebrae. These lesions are consistent with a chronic systemic infection. Given the appearance and distribution of these lesions as well as the cultural and environmental context within which this adult male was recovered, the differential diagnosis includes echinococcosis, paracoccidioidomycosis, coccidioidomycosis, tuberculosis, and pseudopathology. Tuberculosis is tentatively considered the best possible diagnostic option for these lesions. A more definitive diagnostic opinion is, however, withheld owing to a lack of radiographic images, poor anatomical representation, and similarity in the types of lytic lesions produced by infectious diseases. This case is, therefore presented to demonstrate the limitations of paleopathology, specifically regarding the diagnosis of lesions associated with infectious diseases.

A PREHISTORIC CASE OF ANENCEPHALY FROM ARROYO HONDO PUEBLO, NEW MEXICO*. Anna S. Tison, Indiana University, USA

This case study examines a fetus from the Arroyo Hondo collection (~ 110 individuals) that exhibits evidence for anencephaly. This individual was recovered from the Arroyo Hondo Pueblo site, located 4.5 miles south of Santa Fe, New Mexico, during excavations between 1971 and 1974. The fetal specimen (burial 12-6-6-5), aged approximately 8.5 lunar months, was recovered from Component 1, dated to the early 14th century. The skeleton exhibits several severe malformations of the cranial bones and cervical vertebrae. The patterning of these malformations suggests that the calvarium superior to the orbits and petrous portions did not form. The malformation in the cervical vertebrae indicates that this neural tube defect extended inferiorly into the neck. The degree and patterning of the cranial and cervical defects imply a severe form of anencephaly, craniorachischisis totalis. This individual was buried in a subfloor pit in a manner that did not deviate from the mortuary behavior seen at the site. This is the only skeleton from the collection with this type of pathology.

IN THE FOOTSTEPS OF ALEŠ HRDLIČKA. Sylvere C.M. Valentin, California University of Los Angeles, USA, and Lidio M. Valdez, University of Victoria and Californian Institute of Peruvian Studies

The purpose of this poster is to present the first osteological finds of the 2004 summer excavation in the valley of Acari (Peru) by the “Californian Institute of Peruvian Studies” (CIPS). The Acari

Valley provides a continuous occupation from around 1000 BC up to Inka and European contact. It has been argued that many sites in the Acari valley were Nasca sites, but current research shows that a local tradition different from Nasca existed in the valley. The archaeology of Acari has been badly damaged by looting activities and current expansion of the modern town of Acari on archaeological sites. During the 2004 field season, excavations were carried out at the Early Intermediate Period (EIP) site of Huarato, with some additional rescue work carried out at Monte Grande Alto of the same period and Tambo Viejo. For the 2005 field season the EIP site of Amato and some other sites are expected to be excavated.

SKELETAL MANIFESTATIONS OF DOWN SYNDROME AND THE PRESENCE OF DOWN SYNDROME IN ARCHAEOLOGY. Kristine G. E. Watts, University of Reading, England

While there are some cases of skeletal material with suspected Down's syndrome reported in the palaeopathological literature, it is underrepresented, possibly due to poor preservation of fragile remains or the diffuse skeletal features in congenital conditions such as Down's syndrome. This poster aims to outline the results of research on which skeletal features are commonly present in Down's syndrome, which could aid diagnosis of the syndrome in skeletal remains. This research was carried out through performing an extensive study of the relevant palaeopathological and medical literature. A large number of skeletal indicators of Down's syndrome were identified, some more extensively than others; these indicators are identifiable in skeletal remains. The features include: hypoplasia or absence of nasal bones, brachycephaly and absence of the 12th rib. Provided the remains are well preserved and carefully excavated these data indicate that a diagnosis of Down's syndrome as part of a differential diagnosis is possible and this should provide valuable aid in the identification process. When studying some of the effects that Down's syndrome can have on the skeleton, some important consequences have been highlighted for commonly used methods of age, stature and sex estimation. Archaeological and iconographic evidence show that Down's syndrome has been part of human society for at least the last 1000 years and may provide information on the attitudes of contemporary societies towards such individuals.

DIFFERENTIAL DIAGNOSIS OF SCOLIOSIS IN AN EARLY 20TH CENTURY ADOLESCENT FROM THE PROVIDENCE BAPTIST CHURCH CEMETERY, SHELBY COUNTY, TENNESSEE. Rebecca J. Wilson and Lee Meadows Jantz, University of Tennessee, USA

Poor preservation, disarticulation, and youth of skeletal remains often inhibit the diagnosis of scoliosis and its subsequent etiologic classification (Ortner 2003; Aufderheide and Rodríguez-Martín 1998). This paper demonstrates that diagnosis of scoliosis and its possible etiology can be made when enough secondary characteristics/consequences are observed even though vertebral centra are absent. Scoliosis, as defined by Ortner (2003), is any lateral deviation from the midline, in which a curvature develops. Other changes, besides wedging of vertebral centra, include deviation of spinous processes to one side, asymmetries in pedicles and laminae, torsion of the ribs, and limb asymmetry. During the skeletal analysis of the Providence Baptist Church Cemetery, Burial 29, a 10-12 year old possible Black female, demonstrated all of these characteristic symptoms of scoliosis although only one thoracic centrum was present.

The individual's age and the degree of skeletal alteration suggest infantile or juvenile idiopathic scoliosis. However, the appearance of the 10th thoracic vertebral centrum corresponds to the

'wedge-shaped' centrum seen in hemimetimeric vertebrae (Barnes 1994). The possibility exists to have a wedged vertebral body from unilateral epiphyseal arrest (Aufderheide and Rodríguez-Martín 1998), but the concomitant skeletal changes visible in this individual suggest otherwise. It is necessary to evaluate all differential diagnoses when unusual skeletal alterations are present as exemplified by Burial 29.

References

Aufderheide, A. and Rodríguez-Martín, C. 1998 *The Cambridge Encyclopedia of Human Paleopathology*. Cambridge: Cambridge University Press.

Barnes, E. 1994 *Developmental Defects of the Axial Skeleton in Paleopathology*. Niwot, Colorado: University Press of Colorado.

Ortner, D.J. 2003 *Identification of Pathological Conditions in Human Skeletal Remains*. 2nd Edition. New York: Academic Press.

BILATERAL CLUB FOOT: A CASE STUDY FROM TIKAL, GUATEMALA. Lori Wright, Texas A & M University, USA

An incomplete skeleton from Tikal, Guatemala, shows malformed foot bones consistent with a diagnosis of bilateral club foot. The skeleton dates to the end of the Early Classic period, A.D. 380-555, and was recovered from a multiple, disarticulated burial in a high status residence in Group 6D-5. Only the abnormal fibulae and foot bones can be identified as belonging to this individual. An adult age at death is suggested by the fused distal fibular epiphyses; sex is unknown. Both left and right feet show laterally and posteriorly curved fibulae, supero-inferiorly flattened tali and calcanei. The remaining tarsals are very small, with especially reduced dimensions of the plantar aspect of the cuboids and cuneiforms that, together, contribute to a varus curvature of the forefoot. The metatarsals show some lateral deviation of the heads, and abnormally thin diaphyses. Phalanges cannot be identified to this skeleton with certainty. However, several from the burial show very narrow diaphyses, and laterally deviated distal ends, and may be consistent with the pathology shown in this skeleton. A pair of proximal hallucal phalanges show stress fractures of the proximal articulation. Diane France (France Casting, Inc., Fort Collins, CO) kindly made casts of the foot bones that, when articulated, clearly illustrate the nature of the deformity.

* = entered for the Cockburn student prize competition

List of Authors

Brenda J. Baker, Dept of Anthropology, Arizona State University, Box 872402, Tempe AZ 85287-2402, USA; Brendaj.Baker@asu.edu

Patrick Beauchesne, Department of Anthropology, Social Science Center, University of Western Ontario, London, ON, N6A 5C2, Canada; obeauch2@uwo.ca

Ronald Beckett, Bioanthropology Research Institute, Quinnipiac University, Mount Carmel Ave., Hamden CT 06518, USA; ronald.beckett@quinnipiac.edu

Margit Berner, Dept of Biological Archaeology & Anthropology, Natural History Museum, A-1070 Vienna, Burgring 7, Austria; margit.berner@nhm-wien.ac.at

Mark Biesinger, Department of Anthropology, Social Science Center, University of Western Ontario, London, ON, N6A 5C2, Canada

Megan Brickley, Dept of Ancient History & Archaeology, University of Birmingham, Edgbaston, B15 2TT Birmingham, UK; m.b.brickley@bham.ac.uk
Skye Chang, Department of Anthropology, Student Building 130, Indiana University, Bloomington, IN 47405, USA
Michael Colvard, College of Dentistry, Oral Medicine and Diagnostic Sciences, MC 838, University of Illinois, Chicago, 60612,USA; colvard@uic.edu
Gerald Conlogue, Respiratory Care Program, Quinnipiac University, 275 Mount Carmel Ave., Hamden CT 06518, USA; gerald.conlogue@quinnipiac.edu
Della Collins Cook, Department of Anthropology, Student Building 130, Indiana University, Bloomington, IN 47405, USA; cook@indiana.edu
Antonio DeSiena, Museo Archeologico Nationale di Metaponto, Via Aristea, 21, Bernalda (Fraz. Metaponto), Italy
Larry Engel, Engel Brothers Inc., 535 Eighth Ave., Nineteenth Floor, New York, NY 10018, USA
Amy W. Farnbach, 1522 Tijeras Ave NE #14, Albuquerque, NM 87106, USA; farnbach@unm.edu
Marco Fernández, Museo Arqueológico Nacional Brüning de Lambayeque, Avenida Huamachuco S/N, Lambayeque, Peru; museobruninginclamb@yahoo.es
Andrew J. Gallant, Department of Archaeology, University of Durham, South Road, DH1 3LE Durham, UK
Janet Gardner, Department of Anthropology, Social Science Center, University of Western Ontario, London, ON, N6A 5C2, Canada
James Gosman, Dept of Anthropology, The Ohio State University, 124 W. 17th Ave./ 244 Lord Hall, Columbus, OH 43210, USA
Rebecca Gowland, Research Fellow, St John's College, University of Cambridge, CB2 1TP Cambridge, UK; rlg31@cam.ac.uk
Anne L. Grauer, Department of Anthropology, Loyola University of Chicago, 6525 North Sheridan Road, Chicago, IL 60626, USA; agrauer@luc.edu
Julia Gresky, Zentrum Anatomie, Georg-August-Universität Göttingen, Kreuzbergring 36, D-37075 Göttingen, Germany; juliagresky@yahoo.de
Tori D. Heflin, PO Box 91529, San Diego, CA 92169, USA; theflin@ucsd.edu
Charlotte Y. Henderson, 12 Park House Road, Merryoaks, DH13QF Durham, UK; c.y.henderson@durham.ac.uk
Maciej Henneberg, Department of Anatomical Sciences, University of Adelaide Medical School, Adelaide SA, 5005 Australia; maciej.henneberg@adelaide.edu.au
Renata J Henneberg, Department of Anatomical Sciences, University of Adelaide Medical School, Adelaide SA, 5005 Australia; renata.henneberg@adelaide.edu.au
Rebecca J. Hill, 1110 W. Elna Rae Street, Tempe, AZ 85281-5351, USA; beckyhill@qwest.net
Amanda Hitterman, Department of Anthropology, Loyola University of Chicago, 6525 North Sheridan Road, Chicago, IL 60626, USA
Denise Hodges, 455 Dogwood Lane, De Kalb, IL 60115, USA; dhodges@niu.edu
Kristin E. Horner, 971 W. Wendy Way, Gilbert, AZ 85233, USA; Kristin.e.horner@asu.edu
Rachel Ives, Ground Floor Flat, 13 Manor Road, West Ealing, W13 OJALondon, UK; rachel@raives.freeserve.co.uk
Tina Jakob, Department of Archaeology, University of Durham, South Road, DH1 3LE Durham, UK; betina.jakob@durham.ac.uk
Lee Meadows Jantz, Department of Anthropology, University of Tennessee-Knoxville, Knoxville, TN 37996, USA; ljantz@utk.edu
Jeff Jones, Wilson Medical Center, 1705 Tarboro Street SW, Wilson, NC 27893-3428 USA
Frederika Kaestle, Department of Anthropology, Student Building 130, Indiana University, Bloomington, IN 47405, USA

Lynn Kilgore, 402 North County Road, 27 East, Berthoud, CO 80513, USA; lkilgore1027@aol.com
Haagen D. Klaus, Department of Anthropology, The Ohio State University, 124 W. 17th Ave./ 244 Lord Hall, Columbus, OH 43210, USA; klaus.27@osu.edu
Kerstin Kreutz, Institut für Biologie und Chemie, Universität Hildesheim, Marienburger Platz 22, D-31141 Hildesheim, Germany; kreutz@rz.uni-hildesheim.de
Mary Lewis, Department of Archaeology, School of Human and Environmental Sciences, Whiteknights, University of Reading, Box 227, RG6 6AB Poole, UK; m.e.lewis@reading.ac.uk
Nick Lonergan, Department of Anthropology, Northern Illinois University, DeKalb, IL 60115-2853, USA
Elizabeth Martinson (Goodman), Joint POW/MIA Accounting Command's Central Identification Laboratory (JPAC/CIL), 310 Worchester Ave. Bldg 45, Hickam AFB, HI 96853-5530 USA
Simon Mays, Ancient Monuments Laboratory, English Heritage, Fort Cumberland Road, Eastney, PO4 9LD Portsmouth, UK;simon.mays@english-heritage.org.uk
Piers D. Mitchell, 84 Huntingdon Road, East Finchley, N2 9DU London, UK; p.mitchell@clara.co.uk
J.E. Molto, Department of Anthropology, Social Science Center, University of Western Ontario, London, ON, N6A 5C2, Canada; emolto@uwo.ca
Kimmarie A Murphy, Department of Anthropology, Olef Palm House, Kenyon College, Gambier,OH 43022, USA; murphyk@kenyon.edu
Donald J. Ortner, Department of Anthropology, NMNH 345, MRC 112, Smithsonian Institution, Washington DC 20560-0112, USA; ortner.don@nmnh.si.edu
William Pestle, Field Museum of Natural History, 1400 Lake Shore Drive, Chicago, IL 60605, USA; wpestle@fmnh.org
Denis Ponomarev, National Preserve of Tauric Chersonesos, Drevnyaya Street, 1 Sevastopol 99045 Crimea, Ukraine; info@chersonesos.org
Jennifer Raff, 748 Tulip Lane, Greenwood, IN 46143, USA; jraff@bio.indiana.edu
Bruce D. Ragsdale, 1555 Bridle Ridge Trail, San Luis Obispo CA 93405, USA; rags@ccpathology.com
Karl Reinhard, School of Natural Resource Sciences, 126 BH, University of Nebraska – Lincoln, Lincoln NE 68588-0340, USA; reinhard@unlserve.unl.edu
Michael Schultz, Zentrum Anatomie, Georg-August-Universität Göttingen, Kreuzbergring 36, D-37075 Göttingen, Germany; mschult1@gwdg.de
Tyede Schmidt-Schultz, Zentrum Anatomie, Georg-August-Universität Göttingen, Kreuzbergring 36, D-37075 Göttingen Germany; mschult1@gwdg.de
Mary Olive Smith, Engel Brothers Inc., 535 Eighth Ave., Nineteenth Floor, New York, NY 10018,
USA
Michael Spence, Department of Anthropology, Social Science Center, University of Western Ontario, London, ON, N6A 5C2, Canada
Rosa Spencer, 31 Douglas Gardens, DH1 3PU Durham, UK; rosaspencer@hotmail.com
Claire Stigler, Department of Anthropology, Loyola University of Chicago, 6525 North Sheridan Road, Chicago, IL 60626, USA
Daniel H. Temple, Dept of Anthropology, The Ohio State University, 124 W. 17th Ave./ 244 Lord Hall, Columbus, OH 43210, USA; temple.85@osu.edu
Anna S. Tison, Department of Anthropology, Student Building 130, Indiana University, Bloomington, IN 47405, USA; atison@indiana.edu
Lidio M. Valdez, Department of Anthropology, Cornett Building, Room B221, University of Victoria, V8W 2Y2 Victoria BC, Canada ; lvaldez@uvic.ca; also, Californian Institute of Peruvian Studies

Sylvere C.M. Valentin, 4140 Grandview Boulevard, Apt 7, Los Angeles, CA 90066, USA; valentinsylvere2001@yahoo.com
Shane Walker, 1978 E. 102nd Circle, Thornton, CO 80229, USA; shane.walker@colorado.edu
Kristine G. E. Watts, Flat 2, 13 The Avenue, SO17 1XT Southampton, UK; k.g.e.watts@reading.ac.uk
Carlos Wester, Museo Arqueológico Nacional Brüning de Lambayeque, Avenida Huamachuco S/N, Lambayeque, Peru; museobruninginclamb@yahoo.es
Sandra M. Wheeler, 196 Simcoe Street, N6A 5C2 London ON, Canada; swheele@uwo.ca
Alicia K. Wilbur, 3505 Calle Cuervo #1221, Albuquerque, NM 87114, USA; akwilbur@unm.edu
Rebecca J. Wilson, 3108 Rennoc Road, Knoxville, TN 37918, USA; rwilson@utk.edu
Lori Wright, Department of Anthropology, 234 Anthropology Building, 43552 Texas A&M University, College Station TX 77843-4352, USA; lwright@tamu.edu

Committee for the 32nd Annual Meeting (North America)

Charlotte A Roberts (University of Durham, U.K.)
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