Supplement to the *Paleopathology Newsletter*

PALEOPATHOLOGY ASSOCIATION

SCIENTIFIC PROGRAM & ABSTRACTS
THIRTY-FOURTH ANNUAL MEETING
(North America)

MARCH 27 AND 28, 2007

PHILADELPHIA, PENNSYLVANIA

PALEOPATHOLOGY ASSOCIATION

34th Annual Meeting (North America)
Philadelphia, Pennsylvania
March 27 & 28, 2007

SCIENTIFIC PROGRAM

TUESDAY, MARCH 27TH

Morning Session (9.00 am – Noon): Workshop ***Ballroom A and B***
Bone Lesions: Basic Pathogenesis and Anatomy (Donald J. Ortner and Bruce D. Ragsdale)

LUNCH (12:00 – 2:15 PM)
Student Action Committee Meeting (12:00 – 1:00 pm) ***Cook Room***

Afternoon Session (2:15 – 5:00) Frank Rühli, Chair ***Ballroom D and E***

2:15 Announcements and Session Opening
2:20 Cribra Orbitalia Among Commoners at New Kingdom Tell Amarna, Egypt (J.C. Rose and M. Zabecki)
2:40 Comparison of Frequencies and Diachronic Growth of Finds of Malignant Tumors in Europe and Ancient Egypt (E. Strouhal and A. Nemeckova)
3:00 Assessment of Dental Modification and Wear at Chau Hiix, Belize (A. Foley***)
3:20 Break
3:50 Palaeodietary and Biomolecular Analysis of Skeletal Remains with Diffuse Idiopathic Skeletal Hyperostosis from Late Medieval England: Some Preliminary Findings (R. Spencer***)
4:10 Mueller-Weiss Syndrome in Paleopathology (E.A. Tyler***)
4:30 Treponemal Disease in a Coastal South Florida Ossuary (R. Drew***)
4:50 Tuberculosis in the Past: Should Visceral Surface Rib Lesions be Added to the Diagnostic Criteria? (K. Whitaker)
5:10 Announcements

6:00-7:00 pm Cocktails (Cash Bar)
7:00- 8:00 pm Social Dinner
8:00- 9:00 pm Annual Business Meeting

WEDNESDAY, MARCH 28TH

Morning Session (8:00 am – 12:00) Jane Buikstra, Chair ***Ballroom D and E***

8:00 Announcements
8:10 Growth and Vitamin D Deficiency in a Population from 19th Century Birmingham (S. Mays, M. Brickley and R. Ives)
8:30 Abnormally Angulated Sacra in Historic Portuguese Skeletal Collections: Possible Secondary Osteomalacia (D.L. Rainey***)
8:50 The Biocultural Context of Differential Childhood Mortality in 19th Century Wolverhampton (H. Schutkowski and R. Adams)
9:10 An Odontological Analysis of 18th and 19th Century Burial Sites from in and Around Cape Town (T. Manyaapelo and A.G. Morris***)
9:30 The Seven Basic Categories of Disease in the Spine (B.D. Ragsdale)

9:50 Has NAGPRA Impacted the Excavation of Human Skeletal Remains? (C. Banks Whitley***)

10:10 – 11:00 **Break & Poster Session** **Holger Schutkowski, Chair** ***Hamilton Room***

11:00 Abused and Neglected? Trauma and Malnutrition in Roman Children from Poundbury Camp, Dorset UK (M. Lewis)
11:20 Health and Welfare in a Late Anglo-Saxon Community at Bamburgh Castle, Northumberland (S.E. Groves and C.A. Roberts)
11:40 'White Plague' and 'Black Death' in the Medieval Cemetery of Hereford Cathedral, England (A. Boylston, D. Weston, A. Ogden and D. Hurst)

12:00 – 2:00 PM **LET'S DO LUNCH** - Pietro's Pizzeria

Afternoon Session (2.00 – 5.15) **Mary Lewis, Chair** ***Ballroom D and E***

2:00 Announcements
2:05 Paleopathology of Two Scythian Skeletons from Lexandropol, Ukraine (R.K. Wentz)
2:25 Paleopathology, Cultural Identity and Human Sacrifice at the Templo de la Piedra Sagrada, Túcume, Peru (J. M. Toyne)
2:45 Cremation in Prehistoric Eastern North America: an Example from Shelby County, Alabama, with Larger Implications (M.C. Hill and V.R. Beasley, III)
3:05 Auditory Exostoses, Infracranial Skeleto-Muscular Changes, and Maritime Activities in Classical Period Thasos Island (A. Agelarakis, Y. Serpanos, S. Papadopoulos, and S. Tsoutsoubei)
3:25 Break
3:55 The Practice of Artificial Cranial Deformation in Diaguita Populations of Chile's Semiarid North (M.A. Rosado, M. Urizar, and A. Capel)
4:15 The Recovery of Endogenous Corticosteroids from Hair from Archaeological Contexts in Egypt and the Americas (A..J. Nelson, C. White, S. Thomson, M. Rieder, G. Koren and S. Van Uum)
4:35 Ancient Dry Mummy Spatial Tissue Discrimination by Noninvasive Clinical MRI (F. Rühli, H. Von Waldburg, C. Hege, S. Nielles-Vallespin, and P. Speier)

5:00 **Closing Remarks and Announcements:**
Winners of the 2007 Cockburn Student Award
Winner of the Eve Cockburn Service Award
Installation of New President and Vice-President
Introduction of Editor-elect of the *Paleopathology Newsletter*
CASH BAR

***** Entry for the Cockburn Student Award**

ABSTRACTS

SECTION 1: WORKSHOP

Paleopathology Association Workshop # 18: Bone Lesions: Basic Pathogenesis and Anatomy
Donald J. Ortner (Smithsonian Institution, National Museum of Natural History) and Bruce D. Ragsdale (Arizona State University)

The purpose of this workshop is to review the pathogenesis and pathologic anatomy of various bone lesions with a particular emphasis on bone destroying and bone evoking lesions. Abnormalities of human bone include destructive and productive lesions as well as abnormalities in size and/or shape. The location of focal lesions is helpful in diagnosis and the type and distribution of multifocal lesions are similarly important in narrowing the differential diagnosis. The apparent tempo of the process is a potentially important factor in diagnosis and can be discerned from "morphologic analysis", i.e. attention to the character of margins, periosteal reactions and presence or absence of regional remodeling effects. Only two cells can alter bone structure. Osteoblasts form bone and only osteoclasts can delete it. These cells are normally active in the daily remodelling and rejuvenation of the living skeleton. Pathologic anatomy results when pathogens and pathological local conditions stimulate abnormal activity of these cells. An understanding of these conditions is a necessary background to diagnose skeletal disease.

The workshop will consist of a presentation by Dr. Ragsdale on the dynamic pathobiology of bone lesions and will address the following: neurovascular, mechanical and metabolic factors that dictate pathologic alterations; factors that influence the speed with which bone lesions evolve; clues to distinguish chronic from acute skeletal disease. Drs. Ortner and Ragsdale will provide examples of various skeletal lesions from archeological skeletal samples and modern material for the participant's evaluation. Following this, the faculty will review each of the cases highlighting both the type of lesion and the speed with which it was formed along with the probable or established diagnosis.

SECTION 2: PODIUM PRESENTATIONS

'WHITE PLAGUE' AND 'BLACK DEATH' IN THE MEDIEVAL CEMETERY OF HEREFORD CATHEDRAL, ENGLAND
Anthea Boylston (University of Bradford, UK), Darlene Weston (Max Planck Institute for Evolutionary Anthropology, Germany), Alan Ogden (University of Bradford, UK), and Derek Hurst (County Archaeological Service, Worcester, UK)

Tuberculosis can affect people of any age group and attack any organ of the body. It is a disease which is strongly associated with people living in overcrowded conditions with poor standards of hygiene and inadequate nutrition. It was common in England until the 1950s: in AD 1714, 25% of deaths in the parish records were due to consumption and King Charles II touched thousands of people for the 'King's evil' or scrofula. In 1993, some 1194 individuals were recovered from the medieval churchyard adjacent to Hereford Cathedral. Nine of 388 adult males (2.3%) and 17 of 354 adult females (4.8%) demonstrated spinal lesions of tuberculosis. Since only around 5% of cases manifest in bone, almost the entire population was probably infected with the disease and it was twice as common in females as in males. Tuberculous kyphosis occurred in five of these individuals, four females and one male. The youngest of these was a 26-35 year-old female, H2650, whose upper eight thoracic vertebrae were ankylosed. There were few rib lesions and no postcranial joints affected apart from in one clavicle and an ulna. 188 individuals from the cemetery had died as a result of the Black Death in the 14th century and were buried

in plague pits. However, only one showed some evidence of spinal TB. Hereford was a rural town practising an agricultural economy in the medieval period and hence two-way spread of disease between people and their livestock must have been commonplace.

TREPONEMAL DISEASE IN A COASTAL S. FLORIDA OSSUARY
Rose Drew (University of York, UK)

Prehistoric human remains from South Florida with evidence of treponematosis appear to be the furthest south yaws has been identified in this region. A complete set of forelimbs from what appears to be one individual were found in articulation in an ossuary. The site is irregularly riddled with limestone dissolution holes utilized by the prehistoric residents for interment of skeletonized remains. All four elements are severely afflicted by non-venereal treponemal disease, tertiary stage. The elements were found in anatomical position on a slope within a limestone dissolution ravine. They are possibly associated with a pair of saber-shinned tibiae, left and right humeri, and left and right femora found in an adjacent unit immediately north and up slope. Other isolated elements found at this site have lesions suggestive of treponemal disease, including radii, ulnae and saber-shinned tibiae. More than a "case study", this is an argument that non-venereal treponematosis was present in this coastal population. When these specimens were initially examined in March 2005, I concluded the individual had suffered from a form of syphilis. After a few months of consulting the literature, contacting former advisors and continuing analyses on the hundreds of individuals from this ossuary, I became further convinced this was a treponematosis prevalent in the host population. The catalyst for this paper was a week of intense study, including a workshop and conference, and many discussions with colleagues, at PAMinSA I in Rio de Janeiro, Brazil.

ASSESSMENT OF DENTAL MODIFICATION AND WEAR AT CHAU HIIX, BELIZE
Allison Foley (Indiana University, USA)

The deliberate modification of teeth was common among the ancient Maya, yet researchers remain unsure of its function. Williams and White (2006) have suggested that modification styles may be specific to individual Maya sites, reflecting socio-political associations. Analysis of dental modification at Chau Hiix, a site in North Central Belize, reveals preferences for particular styles of modification as well as specific stylistic pattern combinations. Of Romero's modification typology, styles B4, C2/C3 and C4 showed the highest frequencies (filed teeth N=105; 25 individual dentitions) (Romero, 1958). The most common pattern was a B4 filing on the upper central incisors, while the second included C2, C3 and/or C4 filings on lateral incisors and canines. Twenty-seven percent of the adult dentitions were modified at Chau Hiix, yet this may underestimate the true extent of modification at the site. Visible dental modification may be under-represented in the archaeological record as extensive dental attrition can obliterate signs of dental filing. Maxillary central incisors from Chau Hiix were measured and coded for dental wear. Height of the lowest point of the filed incisors was measured to determine the average filing height. The mean filing height was compared to the mean height of the incisors at each wear level by one-sample t-tests. There was no significant difference between the mean filing height and the mean 'severe wear' height. Results support the hypothesis that filings will cease to be visible at more severe wear levels.

References:
Williams JS, White CD. 2006. Dental modification in the Postclassic population from Laminai, Belize. *Ancient Mesoamerica 17*: 139-151.
Romero J. (1958) *Mutilaciones dentarias: Prehispanicas de Mexico y America en general*. Instituto Nacional de Antropologia e Historia Serie Investigaciones 3: Mexico.

HEALTH AND WELFARE IN A LATE ANGLO-SAXON COMMUNITY AT BAMBURGH CASTLE, NORTHUMBERLAND

Sarah E. Groves (the Bamburgh Research Project) and Charlotte A. Roberts (Durham University, UK)

The Bowl Hole cemetery is a well preserved and recently excavated early medieval burial ground associated with the fortress at Bamburgh, Northumberland, the seat of the medieval kings of Northumbria. The skeletal assemblage consists of 94 individuals including adults of both sexes, neonates, juveniles and adolescents, suggesting that the cemetery represents a "normal" population. Analysis of the assemblage as part of Groves' PhD thesis (2006) has suggested that there was a relationship between physical identity and social identity as indicated by variations in burial practice, particularly for older males. The current Arts and Humanities Research Council funded project builds upon this research by using a range of osteological, archaeological and scientific analyses, including analysis of stable isotopes from dental enamel, to address questions about mobility, diet, health, social status and religious change during the 7th-8th centuries AD. This paper will present the initial findings from the osteological analysis of the Bowl Hole sample. While dental enamel defects and cribra orbitalia were infrequent, conditions including osteoarthritis, gout, ankylosing spondylitis, infection, dental disease and trauma have been identified in the skeletal material, along with other more unusual conditions. One individual presents a suite of abnormalities including delayed epiphyseal fusion, destruction of the right knee, vertebral fusion and dental defects. Possible causes for these lesions will be discussed and reasons for the apparently high frequencies of disease in the skeletal sample will be explored.

References

Groves SE. 2006. Spears or ploughshares: multiple indicators of activity related stress and social status in four early Medieval populations from north-east England. PhD Thesis, Department of Archaeology, Durham University

The Bamburgh Research Project (www.bamburghresearchproject.co.uk)

The Arts and Humanities Research Council (www.ahrc.ac.uk)

CREMATION IN PREHISTORIC EASTERN NORTH AMERICA: AN EXAMPLE FROM SHELBY COUNTY, ALABAMA, WITH LARGER IMPLICATONS

M. Cassandra Hill and Virgil R. Beasley, III (MRS Consultants, LLC, USA)

Throughout the prehistory of the Eastern Woodlands of North America, people practiced cremation as a form of postmortem processing. Even though cremations can be found on many sites' inventory lists, they rarely are indicated as a principal means of mortuary treatment. This paper reviews the circumstances for extensive and highly detailed analyses of all burned deposits from the Old Eighty site in Shelby County, Alabama, after which it was concluded that a substantial proportion probably represented episodic interment of cremains and that part of the site was utilized as a mortuary facility during Late Archaic and Woodland periods. These analyses have larger implications for cremation studies because they demonstrate the oftentimes extreme difficulty in identifying cremations in the field and subsequently in the laboratory. At least in Alabama, and perhaps elsewhere, cremation may have been much more widely practiced than was previously thought.

ABUSED AND NEGLECTED? TRAUMA AND MALNUTRITION IN ROMAN CHILDREN FROM POUNDBURY CAMP, DORSET UK

Mary Lewis (University of Reading, UK)

This paper presents preliminary results of a recent review of pathological lesions in 415 late Romano-British non-adults from Poundbury Camp, Dorset. Original research on this group suggested little sign of malnutrition in the population (Farwell and Molleson 1993), although a high prevalence of cribra orbitalia and porotic hyperostosis (or iron-deficiency anaemia) had been noted (Stuart-Macadam, 1991). The

current study uses more recently established diagnostic criteria to re-evaluate the material and shows that 59 (22%) of the non-adults were actually suffering from rickets and/or scurvy, and that another 10 (4.3%) had suffered rib fractures. The diagnosis of trauma in non-adults is rare in the palaeopathological literature, and in some cases rib fractures are considered diagnostic of physical child abuse. This paper explores the social context of this large Roman settlement in order to establish the cause of these conditions, and examines the possibility that some of these children may have been Roman slaves.

This project is part of a larger study into Diaspora communities in Roman Britain, funded by the Arts and Humanities Research Council (AH/E58758).

References

Farwell DE, Molleson TI. 1966-80. *Excavations at Poundbury*. Volume II: The Cemeteries. Dorset: Dorset Natural History and Archaeological Society.

Stuart-Macadam PL. 1991. Anemia in Roman Britain: Poundbury Camp. In H Bush and M Zvelebil (eds.): *Health in Past Societies: Biocultural Interpretations of Human Skeletal Remains in Archaeological Contexts*. Oxford: British Archaeological Research International Series, pp. 101-113.

AN ODONTOLOGICAL ANALYSIS OF 18TH AND 19TH CENTURY BURIAL SITES FROM IN AND AROUND CAPE TOWN

Thabang Manyaapelo and Alan G. Morris (University of Cape Town, South Africa)

The development of the city of Cape Town in the last 20 years has led to the discovery of burial sites not sufficiently documented in the city's archival records. This has led researchers to conclude that these burial grounds belonged to poor, marginalised people who at that time period were not part of the Dutch mainstream communities whose cemeteries are well documented. The aim of this study is to investigate dental disease; dental pathologies; behaviour and lifestyle aspects as seen on dentition including evidence of dental hygiene using standard osteoscopic methods. The remains under study were recovered from three locations: Cobern Street [CS (n=29)] mid 18th century; Marina Residence [MR (n=40)] and Polyoak [PO (n=9)] both late 18th to early 19th century. Marina Residence has 20.1 % of teeth carious, 13.5% of teeth lost antemortem and 83.2% of individuals have linear enamel hypoplasia. The same observations for Cobern Street are 17.9%, 8.0% and 49.5% while Polyoak has the figures 32.1%; 12.9% and 88.9 % incidence respectively. Odontological maladies including aesthetic modification and habitual markers [filing (MR=7.5%; CS=37.9%; P=0%); pipe smoker wear (MR=15%; CS=10.3%; PO=11.1%)] from this study are compared to a slave community from the colonial New York City African Burial Ground as well as two roughly contemporaneous populations from the Netherlands. These two Dutch samples are dated to between 1265 – 1652 AD and 1830 -1858 AD respectively.

GROWTH AND VITAMIN D DEFICIENCY IN A POPULATION FROM 19TH CENTURY BIRMINGHAM

Simon Mays (English Heritage), Megan Brickley, and Rachel Ives (University of Birmingham, UK)

West Midlands of England were the cradle of the industrial revolution. The 19th century AD skeletal remains from St Martins Church Birmingham, West Midlands, provided an important opportunity to assess the health of an urban, working class population at this key point in British history. For a 19th century British skeletal population, St Martins is notable for its large number (N=153) of subadult skeletons and the good spread of ages thereof. Analysis of growth and stress indicators in the juveniles was therefore an important focus of study. We present here some initial findings from our work on the effect of vitamin D deficiency on growth in this population. Modern clinical data suggests that those with vitamin D deficiency may show slowed growth, but this has not yet, to our knowledge, been demonstrated in an archaeological population. We investigate the hypothesis that at Birmingham those with rickets showed slowed growth compared with those lacking signs of the disease. Age at death was estimated

using dental calcification; long bone lengths were used as measures of endochondral bone growth; rickets was diagnosed as previously described (Mays et al., 2006). Results showed that for infants (under 2 years), those with and without rickets were little different in bone lengths. For children older than 2 years however, those with signs of rickets tended to be short for their ages. It was previously suggested (Mays et al., 2006) that in this population rickets may have been a recurrent disease, perhaps on a seasonal (winter) basis. Older children with rickets are more likely to have had multiple episodic or chronic vitamin D deficiency than young infants who may have died after only a short time with rickets or experienced fewer vitamin D deficient winter seasons. Multiple episodes / prolonged vitamin D deficiency disease may be necessary to cause growth deficit sufficient to be detectable in cross sectional samples.

Reference
Mays S, Brickley M, and Ives R. 2006. Skeletal Manifestations of Rickets in Infants and Young Children in a Historic Population from England. *American Journal of Physical Anthropology* 129: 362-374.

THE RECOVERY OF ENDOGENOUS CORTICOSTEROIDS FROM HAIR FROM ARCHAEOLOGICAL CONTEXTS IN EGYPT AND THE AMERICAS

Andrew J. Nelson, Christine White, Steven Thomson, Michael Rieder, Gideon Koren (The Hospital for Sick Children, Toronto), and Stan Van Uum (The University of Western Ontario, Canada)

Hair preserves a dynamic record of biogenic and environmental signals from the months preceding an individual's death. Most analyses of archaeological hair have focused on trace elements and stable isotopes. Techniques have been developed in the fields of toxicology and forensic medicine to measure steroids and other drugs in hair. Recently, we used similar techniques to recover endogenous corticosteroids from modern subjects. In this study we apply this technique for the first time in the archaeological context, and concentrate on cortisol, a hormone generally accepted to increase in response to stress. We present the initial results of the recovery of cortisol from archaeological hair, indicating levels of cortisol that are elevated relative to modern controls. We hypothesize that this may reflect increased stress. We propose that the analysis of the hormone cortisol could be an important component in the total arsenal of biotissue analytical techniques and it should be an important adjunct to other means of assessing levels and timing of stress in ancient populations.

THE SEVEN BASIC CATAGORIES OF DISEASE IN THE SPINE

Bruce D. Ragsdale (Arizona State University, USA)

There are, on this planet at least, only seven basic categories of disease, each having recognizable, although often non-specific, hallmarks in dry bone specimens. Approaching a differential diagnosis with these seven general possibilities in mind rather than hundreds of specific diseases can be a powerful tool for the paleopathologist generating data that is more comparable between observers. The improvement in classificatory agreement has important methodological implications in the development of a data protocol in paleopathological research. The stipulation of general disease category is recommended as part of descriptive and diagnostic reports on specimens since prior workshops indicate it is 30% more likely to be correct than a stab at a specific diagnosis (see Ref.).
Remember the catagories with the acronym "VITAMIN": V = Vascular; T = Trauma/Repair; A = Anomaly; M = Metabolic; I = Innervation/Mechanical; N = Neoplasia.
My presentation is not a "paper" but a picture show, sorting (hopefully) familiar disease conditions into the seven basic categories with a few useful clues along the way.

Reference
Miller E, Ragsdale BD, Ortner DJ. 1996. Accuracy in dry bone diagnosis: a comment on paleopathological methods. *International Journal of Osteoarchaeology* 6:221-229.

ABNORMALLY ANGULATED SACRA IN HISTORIC PORTUGUESE SKELETAL COLLECTIONS: POSSIBLE SECONDARY OSTEOMALACIA

Dori L. Rainey (McMaster University, Canada)

In a study of 292 skeletons from two historic and identified Portuguese skeletal collections, the Luís Lopes Collection curated at the Bocage Museum (National Museum of Natural History, Lisbon, Portugal) and the Coimbra Identified Skeletal Collection housed at the Museu Antropológico, Faculdade de Ciências e Tecnologia, Universidade de Coimbra, twenty-five individuals exhibited abnormally angulated sacra. All individuals were between the ages of 45 and 78 years. Of the 25 individuals, eight are male and seventeen are female. As radiological and histological methods were not possible or allowed, gross morphological examination was the only method of analysis performed. The angulated sacra and other bony morphological observations were analyzed in concordance with documented information such as cause of death, occupation, and place of birth. Abnormally angulated sacra can often be seen in individuals with osteomalacia, which can result mainly from vitamin D deficiency but can also be a secondary condition resulting from other primary diseases. The climate and culture of Portugal make it unlikely that these individuals suffered from a lack of exposure to the sun, making the incidence of osteomalacia in this skeletal collection an important aspect in understanding the pathogenesis of the condition in historic Portugal and in general. In light of all lines of available evidence, it is likely that these individuals suffered from secondary osteomalacia as a result of different primary conditions as indicated by the causes of death in the historical records.

THE PRACTICE OF ARTIFICIAL CRANIAL DEFORMATION IN DIAGUITA POPULATIONS OF CHILE'S SEMIARID NORTH

Maria Araya Rosado, Marcela Urizar, and Adam Capel (Rowan University, USA)

The Museo de La Serena, IV Region, Chile has collections of skeletal remains representing the agricultural Diaguita people of 500 years ago. These were excavated in the 1980s from the sites Penuelas 21 and 24, and Pisco Control of Chile's semiarid north. Their mostly intact preservation has permitted on-going osteobiographical documentation, including that of artificial cranial deformation (ACD). The purposes of this study are to identify, describe, and measure artificial cranial deformation (ACD), as observed by Rosado (1994, 2006) in Diaguita skeletal remains. The study includes a description of ACD type in Diaguita skeletal samples accomplished via: (a) visual identification of ACD type of the calvarium and documentation with photography; (b) detection of ACD through measurements of specific cranial bones affected; (c) comparison of measurements in individuals with and without ACD, by sex and archaeological site; and (c) a demographic comparison to determine if there exist gender specific differences (comparing male and female crania to see if ACD is linked to levels of deformation). The analysis to date indicates that both males and females practiced ACD of the tabular erect type.

CRIBRA ORBITALIA AMONG COMMONERS AT NEW KINGDOM TELL AMARNA, EGYPT

Jerome C. Rose and Melissa Zabecki (University of Arkansas, USA)

The New Kingdom Pharaoh Akhenaten established a new capital city (Tell Amarna) that was built on previously unused land and occupied only once from 1350-1330 BCE. The South Tombs commoner's cemetery represents a unique opportunity to examine skeletons buried over the course of only two decades. The materials reported here were recovered and examined over the course of three field seasons. Trauma and degenerative joint disease suggests that those interred in this cemetery engaged in hard physical labor while infections (both healing and active) are infrequent at only 7%. In contrast, cribra orbitalia is ubiquitous and found on 83% of the juveniles and 19% of the adults. This suggests a diet low in iron associated with folic acid deficiency. This bleak picture is enhanced by a mortality profile with 52% of the individuals dying between 5 and 20 years and a faunal analysis indicating very low meat consumption. This interpretation is discussed in relation to other published Egyptian material.

ANCIENT DRY MUMMY SPATIAL TISSUE DISCRIMINATION BY NONINVASIVE CLINICAL MRI

Frank Rühli, Hendrik von Waldburg (University of Zurich, Zurich, Switzerland), Christian Hege (ZUSE Institute, Germany), Sonia Nielles-Vallespin, and Peter Speier (Siemens AG Medical Solutions, Germany)

Non-invasive imaging of ancient mummies is full of diagnostic pitfalls (Rühli al. 2004), with computed tomography (CT) being the gold-standard. Due to the lack of unbound protons, clinical magnetic resonance imaging (MRI) was applied successfully in ancient dry mummies only after invasive tissue rehydration (Piepenbrink 1986; Sebes et al. 1991). We show for the first time ever – to the best of our knowledge - the diagnostic value of clinical MR settings for spatial discrimination of historic dry tissues. Ancient artificially embalmed Egyptian mummies and a naturally mummified Peruvian corpse have been examined using 3D ultra-short-echo-time (UTE) sequence on a standard 1.5 Tesla clinical MRI scanner (Magnetom Avanto, Siemens AG, Erlangen, Germany). All data were post-processed on a standard Leonardo® workstation (Siemens, Erlangen, Germany) and by Amira 4.1 software (ZUSE Institute, Berlin, Germany). We analyzed ^{1}H-signal-based images (isotropic spatial resolution: 0.8-1.1 mm) of soft tissues, bones, mummification related wrappings or embalming materials. Differential and occasionally superior tissue discrimination is possible by MRI compared to CT: for example, the annulus fibrosus is clearly visible by UTE-MRI. Future applications of this technique may also include forensic cases. MRI – by using UTE sequence and standard clinical hardware - is a feasible modality for non-invasive studies of ancient mummified corpses and allows a sustainable approach favoured for such rare specimens - due to ethical considerations - by lacking any radiation.

References

Piepenbrink H, Frahm J, and Hanse A. 1986. Nuclear magnetic resonance imaging of mummified corpses. *American Journal of Physical Anthropology* 70: 27-8.

Rühli FJ, Chhem RK, and Böni T. 2004. Diagnostic paleoradiology of mummified tissue: interpretation and pitfalls. *Canadian Association of Radiolology Journal* 55: 218-27.

Sebes JI, Langston JW, Gavant ML, and Rothschild BM. 1991. Magnetic resonance imaging of growth recovery lines in fossil vertebrae. *American Journal of Roentgenology* 157: 415-6.

THE BIOCULTURAL CONTEXT OF DIFFERENTIAL CHILDHOOD MORTALITY IN 19TH CENTURY WOLVERHAMPTON

Holger Schutkowski and Rachel Adams (University of Bradford, UK)

Infancy and childhood are the most sensitive phases of human life history and the distribution of mortality and morbidity during these periods are a meaningful proxy of ambient living conditions and local socio-ecology (Lewis 2002). Whilst age-related trends have been studied quite extensively, the inclusion of gender in an appreciation of skeletal indicators of socio-cultural reality has been overlooked, despite recent confirmation of methods suitable for assessing sex in sub-adult individuals (Schutkowski 1993, Sutter 2003). This study is an attempt to address this, using a small assemblage of sub-adult skeletons from 19th century Wolverhampton. In a sample of 36 individuals, whose preservation allowed sex assessment, boys show excess mortality over girls in infancy and early childhood, with a clear peak between one and three years of age. The same pattern is repeated in later childhood and continues into early adolescence. Boys display significantly more pathological alterations related to environmental stress, e.g. cribra orbitalia, periosteal new bone formation or rickets. Even among those individuals without such skeletal markers who may have likely died from acute and rapid insults, e.g. infantile diarrhoea, boys outnumbered girls. This pattern seems to reflect the higher susceptibility of boys to various childhood diseases (Woods & Shelton 1997). Increased mortality in later childhood and early adolescence may have been associated with the combined effects of child labour and deprived living conditions typical of industrial urban environment in Victorian times.

Supported by a NERC Advanced Course Studentship awarded to RA.

References

Lewis ME. 2002. Impact of industrialisation: Comparative study of child health in four sites from medieval and postmedieval England (A.D. 850-1859). *American Journal of Physical Anthropology* 119: 211-223

Schutkowski H. 1993. Sex determination of infant and juvenile skeletons. I: Morphognostic features. *American Journal of Physical Anthropology* 90: 199-205

Sutter RC. 2003. Nonmetric subadult skeletal sexing traits. I: A blind test of the accuracy of eight previously proposed methods using prehistoric known-sex mummies from Northern Chile. *Journal of Forensic Sciences* 48: 927-935

Woods R and Shelton N. 1997. *An Atlas of Victorian Mortality*. Liverpool: Liverpool University Press

PALAEODIETARY AND BIOMOLECULAR ANALYSIS OF SKELETAL REMAINS WITH DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS FROM LATE MEDIEVAL ENGLAND: SOME PRELIMINARY FINDINGS

Rosa Spencer (Durham University, UK)

Diffuse Idiopathic Skeletal Hyperostosis (DISH) is a disorder about which very little is known. It creates distinct patterns of spinal bone growth and fusion in the thoracic vertebrae that are said to resemble dripping candlewax, and enthesophytes that are found on the bones of the postcranial skeleton[1]. The prevalence of DISH appears to increase with age, rarely appearing in those under 40 years of age and is reported as being more prevalent in males than females today, and also in monastic communities in Europe in the past[2,3]. The most prevalent theories regarding the aetiology of DISH are that it is related to specific dietary constituents and obesity, but others suggest that DISH may be present only in 'bone-formers' and therefore has a genetic component[4,5]. This paper will present the preliminary findings of research into the aetiology of DISH. Teeth and bone samples from late medieval monastic and non-monastic (lay) populations were analysed using carbon and nitrogen stable isotope analysis to examine dietary characteristics in relation to the presence or absence of DISH. Ancient DNA analysis was undertaken to determine whether there was any possibility of relatedness between those people with DISH. Whilst the preliminary ancient DNA results indicate that none of the skeletal samples tested are maternally related, statistical analysis indicates that there is no significant difference between the isotope values of those with DISH and those without.

References

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COMPARISON OF FREQUENCIES AND DIACHRONIC GROWTH OF FINDS OF MALIGNANT TUMORS IN EUROPE AND ANCIENT EGYPT

Eugen Strouhal and Alena Němečková (Charles University Prague, Czech Republic)

Material: Up to now, more than 180 finds of malignant tumours in skeletal remains of past people have been assembled by us from the literature and by our own screening. Only well documented cases with clear diagnoses were accepted. They were arranged into five diagnostic groups, viz., sarcoma, hematopoetic tumors, primary carcinoma with malignant epithelioma, osteoplastic metastases of carcinoma, and lytic metastases of carcinoma. The few cases of malignancies in mummies were treated

apart. Methods: The analysis of the cases was based on macroscopic, radiological, and histological examination. In older cases from the literature, some of these methods might be missing. The statistical analysis is presented in column diagrams. Results: The geographic analysis shows that most cases come from Ancient Egypt with Nubia, Germany, and Hungary. Diachronic analysis of finds in Europe reveals a small number throughout the centuries BC and a gradually increasing number in the centuries AD, with culmination in the high Middle Ages. By contrast, the growth curve of tumor cases starts in Egypt in predynastic times and reaches its peak around the beginning of the Common Era, decreasing after that time. Discussion: The increase in frequency of tumor finds expresses obviously the general trend of their growing incidence. The anomalous decline of the number of finds in the last 500 years in Europe and the last 1500 years in Egypt reflects the smaller number of skeletal remains excavated from these periods.

PALEOPATHOLOGY, CULTURAL IDENTITY AND HUMAN SACRIFICE AT THE TEMPLO DE LA PIEDRA SAGRADA, TÚCUME, PERU

J. Marla Toyne (Tulane University, USA)

Group or individual cultural identity in archaeological burial contexts is frequently established based on associated cultural materials and mortuary treatment (for example: body position, tomb type, grave offerings, etc.). In the case of human sacrifice, often the remains are not treated the same as 'natural' deaths in the community and thus are not accorded the same 'typical' burial treatment. As such, the cultural identity of the victims, whether local or foreign, is difficult, if not impossible, to determine archaeologically. There are a number of tools that physical anthropologists can use to provide clues as to the possible identity of the selected victims. While the perimortem trauma analysis reveals clues as to how victims of human sacrifices may have been killed and their bodies treated afterwards, detailed studies of antemortem pathology tell us about what life was like before death. The skeletal biology of the sample may provide clues to the identity of the victims or the basis for their selection. This paper will discuss the demography, the patterns of antemortem trauma, physical morphology and general indicators of stress from the Templo de la Piedra Sagrada sacrificial victims from the north coast of Peru. The sample includes 117 well preserved individuals representing a broad range of ages from 5 to 45 years, of which 41% are subadults and 57% are adult males. While they demonstrated both interpersonal and accidental traumatic injuries, all are well healed. The patterns of pathological conditions in this sample allow us to reject a number of hypotheses concerning the possible origins of these victims.

MUELLER-WEISS SYNDROME IN PALEOPATHOLOGY

Erica A. Tyler (The Ohio State University, USA)

***Winner (Podium Presentation), 2007 Cockburn Student Award Competition**

This study represents the first possible case of Mueller-Weiss syndrome in the paleopathological literature. The disorder was noted in an adult female from the early medieval (580-640 A.D.) cemetery of Saint Sauveur, northern France. Bilateral deformity of the hindfoot is apparent under gross examination. Both foot naviculars are expanded medio-laterally and display healed oblique fractures that have resulted in complete separation of the lateral third of the bone. Mueller-Weiss syndrome is a very rare disease also known as osteopathia deformans, bipartite navicular, spontaneous osteonecrosis or avascular necrosis of the tarsal navicular. The disorder is recognized radiologically as a collapse of the navicular bone similar to stress fracture collapse and subsequent fragmentation. Fragmentation may be caused by increased loading, previous injury, obesity, or underlying diseases such as lupus erythematosus, diabetes mellitus, or rheumatoid arthritis. Differential diagnoses to consider include Kohler's disease, bilateral navicular stress fracture, and Charcot's arthropathy but the most reliable diagnosis for this case is Mueller-Weiss syndrome.

PALEOPATHOLOGY OF TWO SCYTHIAN SKELETONS FROM ALEXANDROPOL, UKRAINE
Rachel K. Wentz (Florida State University, USA)

In 2004 and 2005, two skeletons were excavated from the periphery of the Scythian burial mound, Alexandropol, located in southern Ukraine and dated to 325 BC. Burial 1 is a young male in his late teens who exhibits signs of biological stress, a single Schmorl's node and asymmetrical robusticity of his upper extremities. Burial 2 is a middle-aged male with a healed fracture to the right humerus resulting in significant shortening of the element and extensive remodeling along with associated bony changes to the elbow. He has a healed mid-shaft fracture of the right clavicle and degenerative changes to the spine. Stable isotope analyses are currently being conducted to address issues of diet and mobility. Their pathologies attest to their rugged existence on horseback and in warfare. Both may have served as sacrificial victims, since historic records document the strangulation of attendants and their placement around the periphery of royal mounds. Grave goods indicate both were warriors. The individuals from Alexandropol may have served a Scythian king in life and in death.

TUBERCULOSIS IN THE PAST: SHOULD VISCERAL SURFACE RIB LESIONS BE ADDED TO THE DIAGNOSTIC CRITERIA?
Katie Whitaker (Durham University, UK)

Tuberculosis is a devastating disease that continues to take millions of lives every year. In the past, prior to the antibiotic era, historical records indicate that people of all classes and geographic locations were susceptible to the infection. Thus far our archaeological evidence does not correlate with records, so it is necessary for paleopathologists to improve their diagnostic criteria of tuberculosis. This study aims to examine the reliability of utilising visceral surface rib lesions to aid in the diagnosis of tuberculosis. Seventy-two individuals from the Grant Collection, housed at the University of Toronto, were separated by cause of death. The tuberculosis, pneumonia and control (non-respiratory causes of death) groups each had twenty-four individuals. The skeletons were analysed for the presence of lesions, their locations and distribution on the rib cage and stage of healing. Seventy-five percent of those with tuberculosis as a cause of death displayed lesions. It was also found that the same percentage of individuals with pneumonia as the cause of death had lesions. These findings suggest that visceral surface rib lesions should not be definitively added to the diagnostic criteria for tuberculosis. Instead the lesions should be considered non-specific indicators of a chronic respiratory disease, which can include tuberculosis. Overall, it is necessary for paleopathologists to continue to research to improve our diagnostic methods, so one day the archaeological record will reflect the health of populations in the past.

HAS NAGPRA IMPACTED THE EXCAVATION OF HUMAN SKELETAL REMAINS?
Catrina Banks Whitley (Southern Methodist University)

Though most scholars inherently know NAGPRA has affected the excavation of mortuary contexts and that, in general, archaeologists avoid burials, the extent of its effect has not been quantified. This paper investigates the effects of NAGPRA on the excavation and analysis of mortuary contexts and provides a snapshot of the role of bioarchaeology during archaeological investigations conducted in the United States during the 2005 summer field season. Data for this paper was solicited from field schools held in the United States during the summer of 2005, U.S. CRM firms, government agencies, and museums. Results are presented on a regional and nation-wide scale and indicate whether excavation took place on public, tribal, or private land, and which entities performed the excavation. Unfortunately, the results are not promising for the continued excavation of mortuary contexts by academic field schools, yet, of those who are excavating remains, almost all require that trained skeletal biologists/bioarchaeologists excavate the burial. If this data represents a trend in archaeological research, it will have a significant impact on

the future of research on human skeletal remains, the inclusion of bioarchaeology in problem-oriented research, and our understanding of paleopathology.

SECTION 3: POSTER PRESENTATIONS

AUDITORY EXOSTOSES, INFRACRANIAL SKELETO-MUSCULAR CHANGES, AND MARITIME ACTIVITIES IN CLASSICAL PERIOD THASOS ISLAND

Anagostis Agelarakis, C. Yula Serpanos, Stratis Papadopoulos (Ephoreia of Prehistoric & Classical Antiquities, Greece), and Sofia Tsoutsoubei (Adelphi University, USA)

Acquired external auditory exostoses are an auditory disorder associated with prolonged or repeated exposure to cold aquatic activities (Agelarakis and Serpanos 2002). At the ancient necropolis of Thasos (Agelarakis 1997, 2002) a low prevalence (1.7%) of auditory exostoses has been documented among adult males within 235 post Infancy II individuals, although the city-state was renowned in antiquity for the strength and dependency on its fleet and its seafaring activities in the Aegean (Agelarakis and Zafeiropoulou 2006) and the Black Sea as supported by historical and archaeological records (Papadopoulos 1999). In addition to auditory exostoses, the sample of male individuals showed distinct similarities of infracranial axial and appendicular skeletal changes of skeleto-muscular robustness, trauma and degenerative manifestations which may comprise a pattern; a tell-tale of occupational conditions when juxtaposed to the context of the larger population sample. We also present ethnographic information relative to occupational changes documented among a surviving minority of wooden boat craftsmen on Thasos, comprising nine male individuals of diverse age-subgroups and intra-trade specializations, which in carrying out their specialized activities in hauling and repairing wooden boats use the traditional techniques and tool kits, and hence expose their bodies to similar circumstances of stress as those of antiquity. Our results establish that the low incidence of external auditory exostoses from ancient Thasos may not necessarily reflect issues of preservation, or population sample, but rather the specificity of activities within occupations, and seasonality.

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MULTI-MODALITY PALEOIMAGING OF A SIDESHOW MUMMY

Yvette Bailey, Gerald Conlogue, John Posh (Good Shepard, Bioanthropology Research Institute, USA), and Ronald Beckett (Quinnipiac University)

OBJECTIVE: A mummy that was exhibited in sideshows during the early 20th century was examined using several imaging modalities to determine the presence of any existing paleopathologies and to establish a rationale for each modality employed. METHODS: Initial images were obtained with conventional radiography using film as a recording media, computed tomography (CT), and computed radiography (CR) employing industrial algorithms. RESULTS: Conventional radiography data revealed calcified lymph nodes in the chest and an irregular outer table in the parietal region of the skull bilaterally. A radiolucent defect was also noted on the lateral projection of the left knee. However the anterior-posterior (AP) projection didn't clearly delineate the defect. Magnetic resonance imaging (MR) and computed tomography (CT) followed the preliminary imaging study. Although no signal was received on MR, the CT axial, coronal and sagittal sections clarified the initial findings. DISCUSSION: A differential radiographic analysis of each of the findings is discussed. In addition, the rational for the selection of each of the imaging modality protocols is considered.

LIGHT REFLECTANCE SIGNATURES AMONG MUMMIFIED ORGANS WITH ENDOSCOPIC GUIDANCE AND RADIOGRAPHIC CORRELATION – A PRELIMINARY STUDY

Ronald Beckett, Gerald Conlogue (Quinnipiac University), and David Henderson (Trinity College, Hartford, USA)

Mummified organs are subject to varied degrees of decomposition resulting in partial or complete alteration of morphologic characteristics. These variations are impacted by such variables as embalming method, organ removal, and environmental conditions. Further, loss of the anatomical landmarks associated with an organ system renders identification difficult. Loss of anatomical landmarks, morphologic changes, and varied states of preservation make differentiation with the human eye problematic (Aufderheide & Rodríguez-Martín 1998). Presently, identification of organs is accomplished by sampling/sectioning with subsequent re-hydration for histological, chemical, and pathological analysis (Cockburn *et.al.,* 1998). These destructive processes alter the existing context of the mummified remains. Objective: To determine if non-destructive analysis using light wave reflectance methodology could differentiate among mummified tissues/organs. Methods: We employed a light reflectance probe and spectrometer, endoscopic guidance (Beckett & Guillen 2000, Beckett & Conlogue 2006), and radiographic positional documentation (Beckett & Conlogue 1998). Technical alterations were required to establish standard measuring conditions. We examined tissues/organs in a preserved feline, a 19th century arsenic mummy, and a Late Kingdom Egyptian mummy known as Pa-ib. We collected data to determine reflectance signatures of varied organs, reproducibility, and cross subject comparisons. We established a uniform method of data reporting. Results: varied organs produced different reflectance signatures with a high degree of reproducibility, technical alterations were required, and technology is portable. We recommend reporting and procedural standards for this technique, and future research directions.

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THE EFFECTS OF ENVIRONMENT ON RESPIRATORY HEALTH IN EARLY MEDIEVAL NORTH-EAST ENGLAND

Karen Bernofsky (Durham University, UK)

This study explored the relationship between the external environment and respiratory health by comparing the prevalence rates of chronic maxillary sinusitis and inflammatory rib lesions between two populations with similar lifestyles and environments. The adults from two closely located cemetery samples with an agricultural economy dated approximately AD 8thC- 13thC were analyzed (Spofforth and Bishopsmill School). Comparisons were made of those individuals affected by maxillary sinusitis and/or rib periostitis, by age and sex, and any associations between dental disease and sinusitis were also recorded; methods used adhered to those described by Boocock *et al (*1995*)* and Buikstra and Ubelaker (1994). In those individuals with a minimum of one sinus observable and ribs preserved, at Bishopsmill School 24 of 40 sinuses (60%) in 20 of 25 individuals (80%) had evidence of maxillary sinusitis. At Spofforth, 18 of 55 sinuses (32.7%) in 15 of 36 individuals (41.67%) were afflicted. These results are significantly different (χ^2=6.9835, p≤ 0.01); however, nine individuals with sinusitis at Bishopsmill School and one at Spofforth had associated dental disease. When these were removed the difference ceased to be significant (χ^2=2.3978, p≤ 0.20). The prevalence rate for Bishopsmill School is (significantly) the highest recorded for the period, the next highest being Raunds Furnells (50%, χ^2=7.2014, p≤ 0.01). Only one rib fragment with periostitis was found (Spofforth). There were no significant differences between age and sex groups within the populations for either condition.

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AN EXAMPLE OF ANKYLOSING SPONDYLITIS FROM LATER ANGLO-SAXON ENGLAND

Jo Buckberry (University of Bradford, UK)

This poster presents a case of ankylosing spondylitis from late Anglo-Saxon York. Individual 3505 from Swinegate was buried in a wooden coffin. The grave extended beyond the area of excavation, meaning that only the upper half of this individual was available for analysis. Consequently, age and sex were determined from cranial features, which indicated that he was an adult male, probably aged 36 to 45 years. It was clear, even at the time of excavation, that Swinegate 3505 displayed major pathological change. All the available thoracic vertebrae (1 to 9), the seventh cervical vertebra and ribs 1 to 9 were fused, and had to be lifted *en masse*. Examination revealed that the apophyseal, costo-transverse and costo-vertebral joints were all fully fused, and that there was fusion across the inter-vertebral disk spaces. The anterior surfaces of the vertebral bodies were smooth. All of this evidence, combined with a radiograph showing a 'bamboo-spine' appearance, supports a differential diagnosis of ankylosing spondylitis. The cervical apophyseal joints displayed osteophytes, porosity and eburnation, indicating secondary osteoarthritis. This pathology will have resulted in a severe restriction of mobility and presumably, a reduction in the level of contribution that this individual could make to his own community. However he was buried on consecrated ground in the same manner as the rest of the community and this suggests that, in death at least, this individual was treated as an equal.

TWO HEALED HYOID FRACTURES FROM PREHISTORIC ARIZONA
Scott E. Burnett and Charles F. Merbs (Arizona State University, USA)

Hyoid fractures are rare and frequently associated with strangulation. However, other craniofacial or neck trauma may also be responsible. Survivors may experience pain, and/or difficulty in breathing, swallowing, or speaking. The purpose of this poster is to present two healed cases from prehistoric sites in Arizona. The first case, an old adult male (77/18), was excavated from AZ.U.9.42(ASU) a Classic Hohokam site in Tempe, Arizona. Callous formation has thickened the right greater cornu, which is fused to an ossified lateral thyrohyoid ligament and an ossified portion of thyroid cartilage. Neither cornu was fused to the body of the hyoid, which was not recovered. The second case involves a healed fracture of the right greater cornu in an adult female (B-3) excavated from Grasshopper Pueblo, a Mogollon site in central Arizona occupied during the 13th-14th centuries AD. Another small, healed depression fracture was identified on the right parietal near euryon, but it failed to extend to the endocranial surface. Extensive degenerative destruction and remodeling of the temporomandibular joints (TMJ) was also observed. Blows to the neck and mandible may be responsible for these two rare cases of healed hyoid fractures. In addition to the hyoid fractures, blows to the right side of the throat may have caused trauma to and subsequent ossification of surrounding laryngeal structures in the first case, and possible dislocation of the mandible causing TMJ dysfunction and degeneration in the second case.

PROBABLE CASE OF HYPERTROPHIC OSTEOARTHROPATHY IN AN 11TH -13TH CENTURY AD MALE FROM SOUTH-WEST HUNGARY
Tina Christensen (Roehampton University, UK) , Manuel Martínez-Lavín (Instituo Nacional de Cardiología, Mexico), and Carlos J. Pineda (Instituto Nacional de Rehabilitación, Mexico)

To date only a few cases of hypertrophic osteoarthropathy have been identified from archaeological bone. Here we present a case of a 25-35 year old adult male from the south-west of Hungary. Macroscopic inspection of the skeleton revealed conspicuous thickening of the tibiae and fibulae with “candle wax” appearance of the cortex. A lesser degree of periostitis was found on the femora and on the calcaneal tuberosities. The metatarsals showed bony proliferation. No other alteration of the axial skeleton or the skull was noted. Radiographs showed thickening of the cortex of tubular bones due to a multilayered type of periosteal apposition. No abnormalities of the medullary cavity were noted. Differential diagnosis, possible aetiology, and disease duration are discussed. Both the clinical findings (localization and morphology of the bone changes) and demographic factors (sex and age of the subject) are consistent with the diagnosis of hypertrophic osteoarthropathy. Case studies remain a necessary and vital feature for the growth of palaeopathology contributing to the identification of rare diseases in skeletal human remains.

ON THE ETIOLOGY OF OCCIPITAL LYTIC LESIONS IN ARTIFICIALLY DEFORMED CRANIA
A. Joanne Curtin (University of West Florida, USA)

Supra-inion depressions are shallow midline concavities on the outer table of the occipital bone, located just above inion. Initially believed to be evidence of cranial trauma from surgical trephination or depressed fracture, these lesions are now generally accepted as sequela of certain forms of artificial cranial deformation (Stewart 1976). The precise etiology of the defects is still a matter for debate, but most explanations appear to focus on damage to the overlying soft tissue (ischemic ulcers, bacterial, fungal, and parasitic infections) which ultimately spreads to the underlying bone, leading to localized necrosis (Holliday 1993). Using data derived from two large prehistoric skeletal samples, one from British Columbia and the other from Ohio, including both deformed and undeformed crania, and infants as well as adults, this paper examines the variety of lesions in the supra-inion region, and correlates them to the intensity of deformation as determined by cranial measurements. The results suggest a biomechanical rather than infectious etiology for the lesions.

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DIFFERENTIAL DIAGNOSIS OF CARTILAGINOUS DYSPLASIA AND PROBABLE OSGOOD-SCHLATTER'S DISEASE IN A MISSISSIPPIAN INDIVIDUAL FROM EAST TENNESSEE

Elizabeth A. DiGangi[1,2] and Jonathan D. Bethard[2] ([1]University of Tennessee-Knoxville, USA; [2]Pellissippi State Technical Community College, Knoxville, TX, USA)

This presentation details the differential diagnosis of an adult female skeleton displaying features consistent with a cartilaginous dysplasia and Osgood-Schlatter's disease. This burial was excavated in the 1940's as part of the Works Progress Administration (WPA) archaeological investigations from a Mississippian mound at the Dearmond site, (40RE12) in Roane County, Tennessee. This individual's right humerus and left femur display traits consistent with achondroplasia, such as shortened length and normal width. However, the rest of the long bones display normal length. The affected humerus and femur are 8.4 cm and 5.8 cm shorter than their counterparts, respectively. This makes for obvious asymmetry. Morphological and radiographic analyses were used to rule out possible diagnoses. A review of the various cartilaginous dysplasias revealed the most likely candidate for this suite of traits is enchondromatosis. Enchondromatosis most commonly affects the long bones. It does not affect every bone in the skeleton, and is asymmetrical in its manifestation. In addition, both anterior proximal tibial metaphyses of this individual display defects that are roughly triangular with pitting and irregular floors. Furthermore, the same region on the right tibia is bifurcated. Osgood-Schlatter's disease is caused by trauma to the tibial tuberosity during childhood. This individual would have walked with an obvious limp, and perhaps the added biomechanical stress on both quadriceps muscles as a result caused the injury and resultant defect to its attachment points.

INCIDENCE OF TRACHOMA IN TWO PREHISTORIC LOWER ILLINOIS RIVER VALLEY POPULATIONS

Julie Euber, Della Collins Cook, and Susan Dale Spencer (Indiana University, Bloomington, USA)
***Winner (Poster), 2007 Cockburn Student Award Competition**

Trachoma is an infectious eye disease known to reach high rates in modern-day highly populated communities, but little has been done to investigate its occurrence in prehistoric times. During a study of Australian Aborigines, Stephen G. Webb encountered a lesion of the orbit which he attributes to repeat infections of trachoma (Webb 1990). This study looks at individuals above the age of 39 from the Schild site of the Lower Illinois River Valley in the Mississippian and Late Woodland periods, and four of the orbital lesions described by Webb were found. To further explore the age distribution of the lesion as an indicator of trachoma, individuals in the collection from ages 10-20 were also examined. Although no cases were found in this age bracket, there were many cases of cribra orbitalia, including a case that had a lesion similar to those on prospective trachoma victims amidst the cribrous lesions.

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GRAVE TALES: LIFESTYLES AND HEALTH IN 18TH AND 19TH CENTURY CAPE TOWN

L.J. Friedling and A.G. Morris (University of Cape Town, South Africa)

Both the Cobern Street and Marina Residence burials were accidentally discovered while digging foundations for an office building and residential flats on the margins of the Central Business District of Cape Town, South Africa. The Cobern Street burials were excavated in 1994 and the Marina Residence burials were exposed in 2000. Both form part of the unwalled burial grounds used by the poor underclasses in the 18th and 19th centuries. The aim of the study is to present information relating to the lifestyle and health of the people living at the Cape during the 18th and 19th century. Sixty-four adult skeletons were recovered from the Marina Residence excavations, while the Cobern Street site produced 88 analysable specimens. The age and sex of these individuals were visually and histologically determined using standard techniques. A range of pathologies was discovered in the 152 adults examined. Pathologies include syphilis (n=3), scoliosis (n=3), cribra orbitalia (n=4), porotic hyperostosis (n=2), Schmorl's nodes (n=8), and tuberculosis (n=1). Lifestyle indicators include osteoarthritis (n=69). These occurrences are discussed in relation to the records of life at the Cape in the historic period. A fuller picture of the lives of the poor people of the historic Cape is uncovered as these skeletons are being studied.

CONSEQUENCES OF CONQUEST? THE INTERPRETATION OF SUBADULT TRAUMA AT PURUCHUCO-HUAQUERONES

Catherine M. Gaither (Metropolitan State College of Denver), Melissa Murphy (Bryn Mawr College), Guillermo Cock (Puruchuco-Huaquerones Project), and Elena Goyacochea (National Institute of Culture, Lima, Peru)

Since the health of subadults is a sensitive indicator of population health, changes in subadult health may act as biological markers for certain cultural events impacting the population overall. The cemetery of Puruchuco-Huaquerones, located near the city of Lima, Peru, has yielded numerous human remains dating from the Late Horizon until shortly after Spanish conquest (circa AD 1470-1540). The analysis of over 150 subadult skeletons from this site has demonstrated traumatic lesions ranging from typical childhood 'bumps and bruises' to possible evidence of child abuse and even injuries suggestive of the violent consequences of Spanish conquest. This poster presents the incidence and types of traumatic lesions in the subadults from Puruchuco-Huaqerones. Significant increases were noted in the frequency of subadult trauma, and dramatic changes were seen with respect to the nature of the traumatic lesions, in those remains dating to around the time of conquest. It appears, therefore, that these changes parallel cultural events that were impacting the population. This poster discusses the implications of this analysis within the context of the biocultural impact of Spanish conquest.

A POSSIBLE AMPUTATION OF A FOREARM IN AN INDIVIDUAL FROM POMPEII (79 AD)

Renata J Henneberg, Maciej Henneberg (University of Adelaide), Trenna Albrecht (University of South Australia) and Annamaria Ciarallo (Archaeological Superintendency of Pompeii, Italy)

An isolated proximal half of an adult's left ulna with a healed distal end was found among human skeletal remains excavated at the ancient city of Pompeii, that perished due to volcanic eruption in 79 AD. The fragment of the ulna was examined macroscopically and radiologically. The diaphysis of the bone is swollen and radiologically dense. The medullary cavity is completely closed with an approximately 15 mm long "plug" of dense new bone at the distal "blown up" end. The old cortical borders of the medullary cavity are well visible on the radiograph and the "blown up" appearance of the distal end is due to loose, radiolucent new bone surrounding the original shaft. The clean horizontal break of the bone continuity, visible on the x-ray as a straight cut through the midshaft of the ulna suggests rather the amputation of the forearm than the non-union of a fracture. Lack of atrophic remodeling of the cut end and instead, a healing process with proliferative new bone, suggest that the amputation was successfully performed not long before the death of the person in the volcanic eruption. Due to military activities of the Romans, surgery was probably the most advanced of all medical skills at the time of the expanding empire. Over five thousand various surgical instruments were found in Pompeii.

HYPERTROPHIC OSTEOARTHROPATHY IN BYZANTINE CHERSONESOS (CRIMEA, UKRAINE), 8TH-13TH CE AD

Renata J Henneberg[1,3], Denis Ponomarev[2,3], Adam Rabinowitz[3], and Larisa Sedikova[2] (The University of Adelaide, Australia[1], The National Preserve of Tauric Chersonesos, USA[2], The University of Texas at Austin, USA[3])

Hypertrophic osteoarthropathy (Marie-Bamberger disease) is associated with various diseases where circulatory or vascular abnormalities are present. In living people it is most commonly associated with lung cancer. It is characterised by symmetric periosteal reaction producing proliferation of brittle, disorganised new bone predominantly on long and tubular bones of upper and lower limbs. Pachydermoperiostosis is a familial, affecting mostly males, primary disease with more severe periosteal reaction. Both conditions are rare and also rarely described in archaeological samples. At least two cases of this disorder, both in males, have been found in a skeletal sample of roughly 130 individuals from Chersonesos, southern Crimea, in 9th to 13th centuries AD, the northernmost trading post of the Byzantine Empire. All bones of the almost complete skeleton of a 50-60 years old male were rather heavy. The diaphyses of tibiae, fibulae, ulnae, radii and femora, were covered by a brittle dense subperiosteal new bone growth. Less severe changes were observable on humeri, vertebrae and hand and feet tubular bones. The candle-like bony deposition on the pleural side of ribs was also noted. Other cases bore similar signs. The differential diagnosis between the primary and secondary type and some other diseases (i.e., acromegaly) is attempted. Radiological examination of the tibiae, femora and the skull, the age of the individual and the symmetrical distribution of the pathological signs suggest hypertrophic osteoarthropathy. This finding is important for the general knowledge about the disease, its frequency in the past and the demonstration of its signs in human skeletal material.

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A POSSIBLE CASE OF UPPER-EXTREMITY ABNORMALITY: A RADIAL LONGITUDINAL DYSPLASIA FROM A FRENCH MEDIEVAL CEMETERY

Estelle Herrscher (CNRS - Université de la Méditerranée), Frédérique Valentin (Université Paris 10) , and Renée Colardelle (Musée Archéologique Saint-Laurent de Grenoble, France)

The aim of this paper is to discuss the deformities to size and form of the upper limb of an adult individual (n° S295). The skeleton was discovered in the Saint-Laurent de Grenoble necropolis dated from 1200 to 1310 AD. The morphological and radiological analyses revealed a medial angulation to the distal humerus, absence of the capitulum and a short and antero-posterior bowed ulna; additionally we observed particular modifications of the articular surfaces and enthesopathies. These features are probably associated with a radius aplasia. Based on epidemiological data and reported cases of ancient upper-extremity abnormalities, we propose the following differential pathological diagnoses: cubitus valgus, achondroplastic dwarfism, rickets, scurvy, aplasia of upper segments as well as the possible associated syndromes. This case is important since such a radial longitudinal dysplasia associated with a modification of the humerus and ulna has not been described in paleopathology.

SEVERE DRY-BONE MANIFESTATIONS OF RICKETS IN CHILDHOOD: A REPORTED CASE FROM A MEDIEVAL MASS GRAVE

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A young child (under 9 years old) suffering from severe deformities of its long bones and girdles was discovered during the funerary study of commingled bones excavated from a burial vault in the French Alps (13th-mid-17th century Saint-Laurent de Grenoble, France). The morphological and radiological

analyses revealed anteroposterior and mediolateral convexity of the upper and lower long bones, flaring and cup-shaped depression of the epiphysis as well as bending deformities of the scapular and pelvic girdles (*coxa valga*). A taphonomic process can be rejected due to symmetrical lesions affecting the entire skeleton. The differential diagnosis of pathological manifestations includes congenital dysplasia and metabolic disorder. The diagnosis of rickets is the most probable aetiology since lesions are bilateral and pelvic girdles display a specific stress fracture called "Looser-Milkman's syndrome".

HUMAN DECAPITATION AT AMATO, PERU

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Human decapitation in the south coast of Peru can be interpreted in a number of ways including ancestor worship, ritual sacrifice, trophies of battle or raiding. Many studies have been done in an attempt to corroborate iconography of the south coast region with the physical evidence. An analysis of the newly excavated Early Intermediate Period site of Amato, in the Acari Valley, can help determine the nature of early south coast decapitations. The site contains over 40 decapitated skeletons, and previous literature has suggested that the site may be ceremonial or defensive in nature, based on traces of wall construction (Carmichael 1991, Smith & Valdez 2005, Kowta 1987). Following Buikstra and Ubelaker's standards (1994), this study assesses the 37 skeletons recovered during the 2005 field season at Amato. All 37 individuals are missing the skull and at least the first two cervical vertebrae, but otherwise, the integrity of skeletal articulations suggests primary burial. Cutmark evidence on the remaining cervical vertebrae is fully consistent with decapitation. The skeletal analysis indicates that the age and sex distributions are not consistent with the war trophy or the ancestor worship hypotheses. Older men and women as well as young children and infants predominate. Young adults are rare. Considered in context with other archaeological and forensic observations, the age and sex patterns suggest the remains are victims of raiding or sacrifice.

DIETARY DIFFERENCES IN POST-MEDIEVAL BRITAIN: STABLE ISOTOPIC EVIDENCE FOR REGIONAL VARIATION

Jaime D. Jennings (Durham University, UK)

Documentary sources from the Post-Medieval period in Britain suggest that diets were monotonous and consistent throughout England and across social classes. Stable isotopic data obtained in recent studies on Spitalfields and Cross Bones Burial Ground in London supports the theory that diets were consistent across classes (O'Connell and Hedges, 1999, Millard *et al*, in prep.). The objective of this pilot study was to offer a new dataset of carbon and nitrogen stable isotope ratios for Post-Medieval northwest England, a location previously unrepresented in the published literature, using both bone collagen and hair keratin testing methods. Dietary profiles obtained through this study were expected to be similar to those found in the London populations. Hair keratin and bone collagen samples were collected from ten individuals, two from Matterdale Church, Cumbria, and eight from Hanging Ditch Cemetery, Manchester, and tested for $\delta^{13}C$ and $\delta^{15}N$ levels and C/N ratios. Preliminary results showed lower carbon and nitrogen isotope ratios than expected, suggesting sugar and marine resources were almost non-existent components of this populations' diet. Due to preservation differences, hair keratin test results proved more reliable than those obtained from bone collagen. When directly compared with previously published data from London, the statistically significant differences in mean $\delta^{13}C$ and $\delta^{15}N$ levels suggest regional dietary differences existed in Post-Medieval Britain.

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FROM HERDING TO HOEING: SKELETAL EVIDENCE FOR SUBSISTENCE CHANGE IN NEOLITHIC NUBIA

Margaret A. Judd (University of Pittsburgh, USA)

In Africa, unlike other parts of the world, cattle domestication appeared around 10,000 BP, prior to plant domestication (4000 BP). The health effects of this event are less well known in contrast to the debilitating health consequences attributed to the shift from hunting/foraging to agriculture. Two neighboring Nubian sites, R12 and O16/P37, yielded 166 Neolithic (5900-5800 BP) herders and 71 Early/Middle Kerma (2500-1750 BC) individuals who increasingly practiced agriculture. In the study presented here, chronic stress indicators were grouped as environmental (dental enamel hypoplasia, porotic hyperostosis/cribra orbitalia, infectious disease) or mechanical (osteoarthritis, osteophytosis, Schmorl's nodes, trauma) to determine if a marked change was observable with the shift from a pastoral subsistence base to one that was increasingly reliant on agriculture. Health improved dramatically for subadults during the Kerma period and more individuals reached adulthood. There were no significant differences in the distribution of environmental stress indicators among adults. However, the Kerma adults surpassed the Neolithic adults in the frequency of all mechanical stress indicators, which was statistically significant except for skull trauma ($P < 0.05$). The increase in lesions associated with mechanical stress observed among the Kerma people in contrast to the pattern noted among the Neolithic pastoralists provides evidence for a change in habitual activity and is likely attributable to activities associated with the labor-intensive cultivation of drought-resistant plants, such as sorghum, resulting from increased aridity and subsequent decreased cattle herd size.

TALKING TEETH: A PRELIMINARY STUDY OF HUMAN DENTAL REMAINS FROM SZAZHALOMBATTA, HUNGARY

Gregory D. Lane (Northwestern University, USA)

The 2005 excavation of the Erd 4 site in Szazhalombatta, Hungary, yielded 30 skeletons from a Middle Bronze Age Vatya Period village community. In 2006, the first analysis on these skeletons was performed, specifically on the crania and dental remains. To date, these are the only un-cremated remains found in the area from the Vatya Period. Although theories about the historical, political, social, and economic characteristics from this period are currently developing, these theories lack support from osteological data, leaving gaps in the present data sets. Analyzing dental remains for enamel hypoplasias and caries can provide insight into the diet and nutritional levels of this population. In humans, high frequencies of these dental pathologies are usually indicative of a lower social status, but this relationship between social status and dental pathologies is seldom clear-cut. The Erd 4 skeletons were evaluated to range in age from young children to older adults, with considerable frequencies of caries (20%) and enamel hypoplasias (22%) in most skeletons. The considerable amount of dental pathology is inconsistent with the abundance and variety of floral and faunal species recovered from the excavation site. Thus, a preliminary analysis relating the dental remains, the archaeological data from the Erd 4 village community, and political relationships of the Vatya Period must be done before any conclusions on the political status of this historic population can be reached.

EVIDENCE OF SCURVY IN NORTH AMERICAN ARCHAEOLOGICAL SKELETAL REMAINS

Sara Marsteller (Cornell College) and Donald J. Ortner (Smithsonian Institution, National Museum of Natural History)

Subadult skulls from protohistoric archaeological sites in Maryland and Georgia were surveyed for evidence of scurvy. Areas in which blood vessels are particularly vulnerable to abrasion by muscle activity or trauma caused by minor injury or biomechanical activity were examined for lesions associated with scurvy. Of the 30 individuals surveyed from the Georgia site, only 3 possible cases of scurvy were

found. We suggest this is not due to a lack of scurvy or an indication of adequate nutrition, but more likely the result of differential burial of the youngest children in combination with taphonomic variability in preservation of subadult bones. Both of these variables can be a problem in assessing pathological prevalence within samples from archaeological sites. Of the 65 individuals surveyed from the Maryland site, 10 (15.4%) were diagnosed as probable scorbutic based on presence of multiple lesions of abnormal porosity and/or porous bone formation in multiple areas of the skull known to be associated with hemorrhage in patients with the disease. This prevalence rate is comparable to rates of scurvy found in other Native American populations (Ortner et. al. 1999, Ortner et. al. 2001). Evidence of scurvy provides important information about the diet of these past populations and aids in the understanding of its effect on human adaptation and evolution.

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OSTEOLOGICAL EVIDENCE OF HYPERTROPHIC OSTEOARTHROPATHY IN NEOLITHIC HUNGARY: AN EARLY CASE OF TUBERCULOSIS?

Muriel Masson (University of Edinburgh, UK)

Hypertrophic Osteoarthropathy (HOA), also known as Marie-Bamberger disease, is a periosteal phenomenon characterised by a symmetrical appearance of new bone mainly on the long bones. This condition strongly suggests an underlying chronic pulmonary disease, and has been linked in particular with tuberculosis (TB). During the osteological study of human remains from the Neolithic tell settlement of Hódmezővásárhely-Gorzsa in the South of Hungary, macroscopical analyses revealed a widespread symmetrical periostitis on the long bones and the ribs of a young adult male, indicating a case of HOA. As this site has been dated from 4,970 to 4,594 B.C., and the oldest case of tuberculosis reported in Europe (Heidelberg, Germany) was dated around 5,000 B.C., it would be extremely interesting to be able to confirm the diagnosis of tuberculosis in Hungary at such an early date. Until microbiological analyses can be undertaken to prove the presence of TB, it still remains at least one of the earliest evidence of chronic pulmonary disease in the archaeological record.

INTERVERTEBRAL CHONDROCALCINOSIS: AN EXERCISE IN DIFFERENTIAL DIAGNOSIS

Simon Mays and D. Dungworth (English Heritage, UK)

Chondrocalcinosis is a descriptive term denoting calcification of cartilage. In the spine, chondrocalcinosis of the intervertebral discs and associated structures may arise from a variety of causes including disc degeneration, acromegaly, hyperparathyroidism, amyloidosis, calcium pyrophosphate dihydrate crystal deposition disease, haemochromatosis and ochronosis. This work presents a discussion of intervertebral chondrocalcinosis and its causes using as a case study a skeleton of an elderly male from Mediaeval Ipswich, England. The skeleton is examined using gross observation and radiography, and the cartilagenous calcifications are subject to chemical analysis. In addition to intervertebral chondrocalcinosis (which has resulted in ankylosis of lumbar vertebrae), lesions include chondrocalcinosis at some synovial joints, various soft tissue calcified bodies, and severe osteoarthritis particularly at the gleno-humeral joints. The composition of the calcified deposits resembles diagenetically degraded apatite. Diagnosis is difficult, but these analyses do allow some diagnoses to be advanced at the expense of others. It is suggested that in this case ochronosis may be the best diagnostic option.

UNUSUAL CRANIAL DEFORMATION IN A GALLINA SKELETAL SERIES
Greg C. Nelson and Felicia C. Madimenos (University of Oregon, USA)

Artificial cranial deformation is widespread among the prehistoric Puebloans of the American Southwest. From Pueblo I (approx. 700-900 AD) through Pueblo III (approx. 1100-1300 AD) two types of deformation are commonly described, lambdoidal and occipital flattening, with the former being by far the most common. It was surprising, then, when two cases of obelionic flattening were discovered in a small skeletal series from the Gallina phase site of Cañada Simon I, Rio Arriba County, New Mexico. Excavated in October 2005 and May 2006 this skeletal series consists of seven individuals, five adults and two children < 3 years. All five of the adults and one child exhibit cranial deformation. Here we describe the cases of obelionic flattening and place them into the context of cranial deformation within Southwestern prehistory. Although early workers described some cases of flattening as centering on obelion these were countered by others and, correctly, determined to be examples of lambdoidal flattening. No cases of true obelionic flattening have previously been described from the Pueblo periods. Because cradleboarding is considered the ultimate cause of cranial deformation we briefly explore the mechanics involved in this practice within the Puebloan peoples. Although cradleboard style seems to be standardized during this period, it is possible that simple individual variation in manufacture, particularly the placement of the headrest, is at the root of the variation in angle (relative to the Frankfurt horizontal) and degree of flattening.

MULTIMODAL ANALYSES OF VARIABILITY IN TRANSNASAL CRANIOTOMY LESIONS IN EGYPTIAN MUMMIES

Andrew J. Nelson (The University of Western Ontario, Canada), Gerald Conlogue, Ron Beckett, (Quinnipiac University, USA), John Posh (The Imaging Center at Good Shepherd, USA), Rethy Chhem, Erin Wright (The University of Alberta, Canada), and J Rogers (St Joseph's Health Care, USA)

Herodotus described the removal of the brain through the nose as a key part of the process of mummification in Ancient Egypt. Most modern authors have described the resulting lesion as a defect in the cribriform plate of the ethmoid bone, although some variability in location and extent has been noted. In this paper we present work done to describe the craniotomy defect in greater detail, using plain film radiography, endoscopy and CT scans. We focus on two Egyptian mummies: Pa-Ib, an adult female from the Late Kingdom and "Lady Hudson" an adult female from the Roman Period. Both mummies demonstrate lesions that extend well beyond the cribriform plate, particularly "Lady Hudson", whose defect extends from the crista galli into the sella turcica. Our multimodal analyses suggest that lateral plain film radiographs do not give a full accounting for the extent and anatomical detail of these lesions. Therefore, the degree of variability is probably underestimated. Endoscopic examination and CT imaging are critical tools in the descriptive process. We call for increased use of these tools to focus on the description of the craniotomy lesion in order to gain a better understanding of its variability through time and place.

THE CHILDREN IN THE SEWER – INFANTICIDE IN THE ROMAN CIVILIAN CITY CARNUNTUM?

Doris Pany, Margit Berner, (Natural History Museum, Vienna, Austria), Silvia Radbauer (Archaeological Park Carnuntum, Austria), and Günther Karl Kunst (Vienna Institute for Archaeological Science (VIAS, Vienna)

Numerous fragments of fetal and newborn skeletal remains were recently excavated in the civilian city of Carnuntum, Austria. The human remains were discovered together with animal bones in a Roman sewer. It dates to the end of the 2nd century A.D. and derives from the nearby bath house in the ancient city. The

demographic profile reveals that the majority (maximum number 27) of the individuals (total maximum number 31) died at about the time of birth. Signs of severe pathological alterations could not be identified by macroscopic investigation. The perinatal age distribution of the infants argues for a disposal of "unwanted children", rather than natural deaths of the newborns. This practice is documented in written sources of Roman society. On the other hand, it has been discussed that an age distribution of infants with a peak around birth is suggestive of infanticide (Mays 2001). Although further work needs to be done, we assume that our results can be seen as a parallel finding to the infanticide victims of Ashkelon (Israel) and Roman Britain (Faerman *et.al*. 1998, Mays & Faerman 2001).

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THE USE OF MRI IN THE EVALUATION OF THREE MUMMIES WITH VARYING METHODS OF PRESERVATION

John Posh (The Imaging Center at Good Shepherd, USA), Gerald Conlogue, and Ron Beckett (Quinnipiac University, USA)

Purpose: Advanced imaging modalities have become commonplace in the evaluation of mummified remains. We wanted to determine the role of MRI in this process. Methods: We imaged three specimens for this project. A natural black mummy from Peru, a formalyn mummy from the Eastern United States, and an Arsenic mummy from the American Southwest. All three were imaging at 1.5Tesla and had CT imaging correlation. Results: All three specimens were imaged successfully with MRI. The resultant images were of varying quality but all demonstrated gross anatomy and the overall distribution of residual lipids. Conclusions: MRI is a valuable adjunct to other imaging techniques.

MACROSCOPIC AND MICROSCOPIC ANALYSIS OF CALCINED BONE, EARLY ARCHAIC, SITE 28-CU-79, CUMBERLAND COUNTY, NEW JERSEY

Maria Araya Rosado, Adam Capel, and Kimberly Cuccia (Rowan University, USA, and Museo de La Serena, La Serena, Chile)

Stout (1978) and Holden et al (1995) indicate that the histomorphology of archaeological bone is often found to be well preserved under a variety of taphonomic conditions. Therefore, microscopic analysis of first level histologic structures is possible and can aid in the identification of fragmentary bone samples as animal or human. By comparing bone trabecular structures of known animals (cow, goat, dog) and human trabecular bones, at 10X magnification, we have established a data range of variable traits by which unidentified samples can be compared. Known animal bones display a largely elongated, prismatic/sharp edged trabecular structure, while known human bones display a more circular/oval structure pattern. This process of identification has been applied to fragmented calcined bones of Early Archaic period, site 28-CU-79, Cumberland County, New Jersey. The trabecular structure of the anatomically known animal (unknown taxa) bone fragments of site 28-CU-79 consisted of more prismatic trabecular structures. This was true also of many of the unknown, spongy bone fragments when looked at microscopically. For comparison, known animal (archaeological guanaco and seal) and human samples from the Museo de La Serena, Chile (Late Archaic ca. 3000 YBP and farming periods, Diaguita, ca. 500 YBP) have also been microscopically analyzed. These also display the comparative differences in the trabecular structures. This communication presents the data range of trabecular differences observed as a way to help identify unknown bone fragments for bioarchaeological and forensic purposes.

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DENTAL PATHOLOGY AND DIET AT THE SITE OF KHIRBAT AL-MUDAYNA (JORDAN)
Joshua W. Sadvari (University of Pittsburgh, USA)

The first seeds of agricultural practice were sown in the Levant over 10,000 years ago, and since then, this subsistence pattern has undergone great intensification. By the time of the Iron Age II and Nabataean periods (ca. 1000 BCE – 100 CE), the inhabitants of the site of Khirbat al-Mudayna in Jordan practiced a mixture of pastoralism and intensive agriculture, a subsistence pattern still undertaken by the Bedouin villagers occupying that area today. While archaeological evidence exists to support the belief that Khirbat al-Mudayna was an area of intensive agriculture for thousands of years, an analysis of dental pathology would be invaluable in an effort to further strengthen this idea. An analysis of dental pathology was carried out on a historical Bedouin skeletal sample from Khirbat al-Mudayna in an effort to generate a Dental Pathology Profile (DPP), based on that of Lukacs (1989). Dental calculus, caries, abscesses, attrition, periodontal diseases, and antemortem tooth loss (AMTL) were assessed, and a DPP for this skeletal population was constructed. Results show fairly high proportions of calculus, caries, pulp exposure and abscesses associated with carious lesions, periodontal disease, and a mid-range value for the proportion of AMTL. These results are consistent with those characterizing agricultural populations and add valuable evidence, in the form of a Dental Pathology Profile, supporting the idea that the inhabitants of Khirbat al-Mudayna were, and still are, a society built around intensive agriculture.

A 15TH CENTURY OSTEOPOROTIC HIP FRACTURE WITH COMPLICATIONS
Ellen Salter-Pedersen (Indiana University, USA)

Osteoporotic hip fractures are rare in the paleopathological record. During preliminary studies of the Rinconada Alta skeletal collection, an osteoporotic fracture in the neck of the left femur of an elderly woman was identified. Rinconada Alta is a site on the outskirts of Lima, Peru. The cemetery dates to the Inca Period (1470-1532) but the interments are primarily lower class, non-Inca craftspeople. This burial may have been disturbed in prehistoric times and only the lower half of the body is present. Aging of this individual is difficult as changes to the pubic symphysis and auricular surface, and the development of vertebral peripheral osteophytes may have been exacerbated by the trauma. Other aging techniques, including the ribs, cranial suture closure and dental wear are not possible due to missing elements. This osteoporotic fracture is especially interesting given the other complications present. The acetabulum has been remodeled into a semicircular shape while the head of the femur, also extensively remodeled, has been flattened and an articular facet is present on the posterior surface of the femoral neck. The right femur, or "unaffected" side, shows an enlarged acetabulum with evidence of arthritis and robusticity, which are likely responses to the trauma on the left side. The pattern of the fracture and the remodeling of the femora and innominates are examined in regards to differential diagnoses, including hip dislocation, slipped capital femoral epiphyses and avascular necrosis.

A GLIMPSE INTO THE DAILY ACTIVITIES OF AN EARLY-MEDIEVAL WELSH COMMUNITY
Kathleen A. Satterlee Blake (University of Pittsburgh, USA)

Muscle stress markers (MSM) and overall bone robusticity were evaluated for the upper limb bones of individuals from the Atlantic Trading Estate (ATE) cemetery site, in Barry, Wales (@ AD 350 – 900). MSM lesions, found at muscle attachment sites, develop in response to repeated mechanical stress and

can facilitate daily activity reconstruction in ancient populations. Upper limbs of the adult individuals (n=36) were evaluated using the methods outlined by Hawkey and Merbs (1995). Robusticity was determined by an overall size score based on the sum of the circumference, anterior/posterior and medial/lateral diameter measurements (Hawkey and Merbs 1995). The population showed enlarged MSM scores and notably robust bones. MSM scores differed between the sexes, with males exhibiting larger scores. Males with low MSM values displayed less robust bones than those with larger MSM values, but females did not follow this trend. These results may be due to a rural, agricultural lifestyle, with an active life of manual labor (Chapman 1997), particularly among males, as well as interaction with domesticated animals. Additionally, life spent exploiting the nearby rocky coast for food could create similar results (Hawkey and Merbs 1995; Toyne 2004). Little is known about ancient Welsh society from a bioarchaeological perspective and these results offer a glimpse into the rigorous life in southeastern Wales during the early medieval period.

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DIFFERENTIAL DIAGNOSIS OF BILATERAL PARIETAL LESIONS OF AN INDIVIDUAL FROM EL KINEL, GUATEMALA

Andrew K. Scherer (Wagner College, USA) and Ana Lucia Arroyave (Universidad de San Carlos, Guatemala)

We report on an unusual case of bilateral parietal lesions of an individual from the Late Classic (A.D. 600-800) Maya site of El Kinel, Guatemala. These symmetrical depressed lesions are located on the posterior portions of the left and right parietals, superior to the lambdoidal suture. The cranium also exhibits tabular oblique artificial cranial deformation. Trauma associated with the artificial cranial deformation, biparietal thinning, sebaceous cysts, and a variant of enlarged biparietal foramina are all considered in this differential diagnosis. The location, size, and bilateral symmetry of the lesions are consistent with enlarged biparietal foramina. However, the endocranial table is ossified within these lesions and perforation of the cranium is not complete. From this differential diagnosis, these lesions appear to be a variant of enlarged biparietal foramina though additional research is needed to understand their specific etiology. Although the skeletal sample from El Kinel is small (n = 6), no other cases of this pathology were observed at the site.

TRAUMA AND A POSSIBLE GENETIC DISORDER IN A PREHISTORIC MALE FROM SOUTHWEST INDIANA

Susan Dale Spencer (Indiana University, USA)

A Late Mississippian (A.D. 1400-1600) adult male from the Mann Site (12 Po 2) presents both skeletal trauma and multiple anomalies that suggest either a genetic disorder or an acquired metabolic disease. Areas of trauma include bilateral fractures of the mandibular body near the ascending ramus and fractures of both clavicles. All of the fractures are solidly united. Pathologies of the skull include porotic hyperostosis that involves the occipital (parietal thickness =18mm), bilateral posterior wall external auditory exostoses, LEH, polycaries, and slight lambdoidal deformation with multiple sutural ossicles along the lambdoid suture. Anomalies and pathologies of the postcranial skeleton include general cortical bone loss, small hands and feet, small pelvic inlet, coxa vara of the femora, and acetabular creases. Z-

score analysis indicates a significantly ($p<0.05$) small talus length and an atrophied neck of the humerus. Significantly large ($p<0.05$) measurements include cranial breadth and the parietal chord. Height appears normal, and there is no evidence of long term immobility. Differential diagnoses include Trisomy 21, Fanconi's anemia and a mutation on the SALL4 gene.

GOUT IN PALEOPATHOLOGY: THE ELUSIVE NATURE OF URATE

David Swinson, Megan Brickley, John Snaith, (University of Birmingham), and Jo Buckberry, University of Bradford, UK

The differential diagnosis of arthritis in paleopathology is very dependant on the character and distribution of the lesions. Only two examples of the preservation of uric acid (UA) are known, both in mummified specimens (Eliot-Smith and Dawson 1924, Ordi et al. 2006). We describe a method of detecting UA in bone that is likely to aid the diagnosis of gout. Six skeletons from the UK were examined, four (A,B,C,D) from an 18th/19th century cemetery, and two (E,F) from medieval graveyards. B and C and D were non-gouty controls. A, E and F had erosions in the feet typical of gout, both grossly and radiographically. All three had large undercut erosions of the first metatarsal heads. Smaller lesions were also present in A and E, along with a white chalky powder. The powder from A and E was examined by polarising microscopy. Initial examinations were negative for crystals, but subsequent examination showed small numbers with the characteristics of urate. The murexide test on A's powder was negative for UA and mass spectrometry showed calcium apatite. High Performance Liquid Chromatography (HPLC) produced positive results for UA in A from powder and bone samples. Bone from the controls was negative for UA, as were bone samples from E and F, and powder from E. HPLC can be used to detect evidence of UA overload, but its persistence in archaeological bone appears unreliable, and factors determining this are unknown. Although the powder had the macroscopic appearance of tophaceous urate, the presence of calcium apatite suggests it is largely the result of an eroding tophus calcifying.

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PATHOLOGICAL FINDS IN A POOR HOUSE CEMETERY OF THE 18TH CENTURY (WIEN-KAISEREBERSDORF) – PRELIMINARY RESULTS

Maria Teschler-Nicola, Doris Schamall (Natural History Museum Vienna), and Michaela Müller (Stadtarchäologie Wien, Austria)

In 1994/95 a part of a cemetery, localised close to a poor house and a chapel in the castle of Kaiserebersdorf, south east of Vienna, was recovered by the *Wiener Stadtarchäologie.* The poor house was established by the Habsburg empress Maria Theresia as social institution aiming the support of diseased and handicapped people. Here orphans and elderly people of both sexes were also encouraged to manual labour. Additionally, all inhabitants acquired not only hygienic and medical care; they were also supplied in accordance to their individual and health condition by a special diet. The skeletal remains of 40 individuals (among them 20 females, 11 males) were systematically investigated according to their type and frequencies of pathological alterations. Here we present some of the preliminary results obtained by macroscopically and by radiological analyses. Interestingly, several individuals exhibit severe loss of bone mineral content (a diagnostic feature pointing to rachitic/osteomalacic and/or osteoporotic malconditions) and infectious diseases (e.g, tuberculosis). We discuss our findings in the context of the bequeathed historical data and hermeneutic records of that time.

MULTIPLE CASES OF INHERITED METABOLIC DISORDER (MUCOPOLYSACCHARIDOSIS) IN A MEDIAEVAL POPULATION FROM POTTENBRUNN, LOWER AUSTRIA

Maria Teschler-Nicola (Natural History Museum Vienna**,** Austria), Kelly Harkins (Arizona State University), and Doris Schamall (Natural History Museum Vienna**,** Austria)

Among 199 investigated individuals of Pottenbrunn cemetery, dated to the 9th century AD, several craniofacial and postcranial malformations which have been rarely identified in historic populations could be observed. The main features include e.g., depression in the region of the nose, irregular shape and thickening of several portions of the maxilla, zygomatic bone, and the mandible as well as a severe hypoplasia of the condyles. The neurocranium shows massive thickening within the parieto-temporal area and an abnormal shaped foramen magnum. Although all these individuals are subadults, they are characterized by a reduced body size, generalized epiphyseal dysplasia, and angulated facies articulares at the upper limb bones, hypoplastic clavicles and femoral necks as well as vertebral flattening. The symptoms described macroscopically and investigated by X-ray and CT analysis substantiate the infrequent recorded genetic mucopolysaccharidosis (MPS) in the Pottenbrunn grave field. We have now identified three unambiguous and six possible cases of MPS, whereby different moderate to severe manifestations - most probably due to a progressive course - could be observed. This picture is in accordance with the clinical reports, which point to an age-related impairment of the MPS phenotype. This autosomal or X-chromosomal acquired pathology comprises a malfunction or lack of a lysosomal degradation enzyme, accumulating mucopolysaccharides (glycosaminoglycans) in the cells leading to a progressive disorder and involving many organs. Typically, several members of a family are affected.

THE EXPRESSION OF CANCER ON BONE

Rebecca J. Wilson and Donna McCarthy (University of Tennessee, Knoxville, USA)

Differentiating the expression of cancer in documented skeletal remains will enable the paleopathologist to better diagnose and describe neoplasms in the archaeological record. It is suggested that the interaction of the osteoblastic and osteoclastic activity relating to bone tumors and tumorous lesions is best detected microscopically; however, destructive analyses are often prohibited on archaeological materials. This illuminates the need to further develop the macroscopic signatures by which differential diagnoses of cancer are made. The William M. Bass collection (N=567), a documented collection of modern anatomical donations to the Department of Anthropology at the University of Tennessee, Knoxville, was surveyed for individuals having cancer as the cause of death (N=28). Each case was examined to determine if the skeleton was affected, the extent in which it was affected, and if there was a pattern to affected elements. Three different responses were noted: lytic activity, an inflammatory response, and remodeling/plasticity of the bone. Those cancers that metastasized from an organ to adjacent bone tended to be expressed as lytic activity affecting the integrity of the entire bone making a differential diagnosis feasible. Most cancers that metastasized throughout the body, affecting several elements, expressed themselves as an inflammatory response to the periosteum inhibiting our ability to determine the origin of insult and thus the specific cancer. Benign tumors tended to cause bone remodeling highlighting the plastic nature of bone. The description of these cases enhances the diagnosis of cancer discourse by elucidating the different ways in which neoplasms can be expressed in the skeleton.

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