LIST OF PRESENTERS

Marie-Catherine Bernard (Department of Archaeology, University of Durham) Medical records of the children from Stannington Sanatorium: analysis of the bone and joint cases.

Helena Berry (Institute of Archaeology and Antiquity, University of Birmingham) Integrating the body and the burial: a multivariate statistical exploration of the social correlates of health, nutrition and funerary treatment in Hellenistic Greece.

Ceri Boston Growth study of sub-adults of the Late Anglo-Saxon/ Norman population of Blackgate, Newcastle-upon-Tyne.

Gilly Carr (Classical and Archaeological Studies, University of Kent Canterbury) Ambiguous bodies and hybrid identities in early Roman Britain.

Margaret Clegg (Dept of Anthropology, University College London) Not so dumb after all: the evolution of the human vocal tract.

Mathew Collins, Darrel Maddy and Kirsty Penkman (The Amino Acid Racemization Laboratory, University of Newcastle) Racemization dating: La Jolla or a jewel of a method?

Chris Deter (Institute of Archaeology, University College London) Dental wear patterns of hunter-gatherers and agriculturists: the direct human impact of human behavioural changes accompanying this transition.

Linda Fibiger Back in action - a study of lumbar spondylolysis as activity-related lower back trauma.

Charlie Frowd (Face Perception Laboratory, Department of Psychology, University of Stirling) A holistic, evolutionary face identification system (EvoFIT).

Tina Jakob (Department of Archaeology, University of Durham) A palaeopathological assessment of early Medieval non-adults from English and German skeletal samples.

Mandy Jay (Department of Archaeological Sciences, University of Bradford) Iron Age diet: stable isotopes from Wetwang, East Yorkshire.

Chris Knüsel (Department of Archaeological Sciences, University of Bradford) The second horseman of the apocalypse: of boastful warriors, holy blissful martyrs, and cruel avengers against their enemies.

Jon Le Huray (Department of Archaeological Sciences, University of Bradford) Diet and social stratification in Iron Age Bohemia: initial data from Kutná Hora – Karlov, Czech Republic.

Gabriele A. Macho (Department of Human Anatomy & Cell Biology, The University of Liverpool) The phylogenetic relationships and functional adaptations of Plio-Pleistocene hominins.

Brooke Magnanti (Department of Forensic Pathology, University of Sheffield) Data analysis through automatic tools.

Patrick Mahoney (Department of Archaeology and Prehistory, University of Sheffield) Human dental microwear during the development from a hunter-gatherer to an agricultural economy in northern Israel: preliminary results.

Xanthé D.G. Mallett (Department of Archaeological Sciences, University of Bradford) Ontogenetic lead accumulation.

Melissa Melikian (AOC Archaeology Group) A case of metastatic carcinoma of the breast from 18th century London.

Piers Mitchell[1], J.P Huntley & E. Stern ([1]Wellcome Centre for the History of Medicine at UCL, University College London) Dietary modification as a medical treatment in the Medieval hospital: evidence from the 13th century latrines of the Crusader Hospital of St. John at Acre, Israel.

Gundula Müldner (Department of Archaeological Sciences, University of Bradford) Fast or feast: social differences in Later Medieval diet by stable isotope analyses.

Kurt Prangenberg (School of Civil Engineering and Geosciences, University of Newcasstle upon Tyne) MM-wise sampling provides new insights into bone chemistry.

Rebecca Redfern (Department of Ancient History and Archaeology, University of Birmingham) Painful and infectious - life in Iron Age Dorset.

Jill A. Rhodes (Department of Archaeological Sciences, University of Bradford) Humeral torsion and activity-related change in the human upper limb: towards an appreciation of skeletal plasticity and adaptation.

John Robb and Kostalena Michelaki (Department of Archaeology, University of Cambridge) What do paleopathology rates actually mean?

Marianne Schweich (Department of Archaeological Sciences, University of Bradford) Stature, body proportions, and social inequality in European archaeological populations.

Bill Sellers (Dept of Human Sciences, University of Loughborough) Using gait morphing to reconstruct the locomotion of early hominids.

Rick Steckel (Dept of Economic History, London School of Economics) A history of health in Europe from the Late Paleolithic era to the present: brief description of a research project.

Judi Sture (Department of Archaeological Sciences, University of Bradford) Developmental defects in medieval England: evidence of environmental influence.

Maryanne Tafuri, J. Robb, M. Mastroroberto, L. Salvadei and G. Manzi (University of Southampton, Cambridge University, Soprintendenza Archeologica di Pompeii, Museo Nazionale L. Pigorini, Rome, Università La Sapienza di Roma) 'Marrying in and eating out': trace element analysis and social mobility in a Southern Italian Bronze Age community.

Sarah P. Tatham (School of Archaeology and Ancient History, University of Leicester) Diseases and injuries in medieval Rouen.

Tim Thompson (Forensic Pathology, University of Sheffield) Re-animating the dead: keeping statistics real.

Philip Vidal (INRAP, University of Bordeaux, France) Palaeoepidemiological study of DISH in the east of France.

Efrossini Vika (Department of Archaeological Sciences, University of Bradford) Born with a silver spoon? Status ascription and dietary variation in a Bronze Age Greek cemetery.

Anna Williams (Department of Forensic Pathology, University of Sheffield) The brain for anthropologists.

Marie-Catherine Bernard

Medical records of the children from Stannington Sanatorium: analysis of the bone and joint cases

Session: Palaeopathology/Open

This paper is a continuing study of the medical records held at the Northumberland Records Office in Morpeth, Northumberland which was presented at this year's American Association of Physical Anthropologists (AAPA) conference in Buffalo, U.S.A. Stannington sanatorium, located in northeast England, treated children suffering from all types of tuberculosis (TB). Over a thousand medical files have been recorded to date, permitting a detailed demographic study of the population admitted to Stannington between 1936 and 1953. Although the majority of the children were suffering from the pulmonary type of the disease, there were many cases of tuberculosis affecting the bones and joints (n= 127 or 8%). These cases affecting the skeleton will be discussed in this paper. There were more females than males suffering from TB of the bones and joints by a proportion of 55 to 45%, and most of the children came from urban backgrounds. They spent on average around 38 months for the boys and 39 months for the girls in the sanatorium. The type of treatment they received while at Stannington varied over time but included chemotherapy from 1946 onwards. The data gathered from these files holds important information on how tuberculosis was treated in children in the recent past.

Helena Berry

Integrating the body and the burial: a multivariate statistical exploration of the social correlates of health, nutrition and funerary treatment in Hellenistic Greece

Session: Social Reflections

Health status and funerary practices are both the products of social mechanisms. Within their separate disciplines funerary archaeologists and osteologists have exploited this fact in the interpretation of their respective data sources. However, despite the fact that their respective evidential sources frequently derive from the same archaeological contexts, traditional approaches to the interpretation of funerary evidence and osteological data can be seen to have placed a low priority on the integration of evidential types. This paper presents a model based on a modified theoretical and methodological approach to integrated datasets and its application to skeletal material from the city of Ambrakia in Hellenistic Greece. The results of the study demonstrate that the integration of contextual funerary, osteological, pathological and stable isotopic data can provide new arenas for the interpretation of funerary data in terms of social status, cultural practices and the lived experience of social groups in past societies.

Ceri Boston

Growth study of sub-adults of the Late Anglo-Saxon/ Norman population of Blackgate, Newcastle-upon-Tyne.

Session: Posters

The growth of sub-adults remains one of the most sensitive indicators of the general health of a population. In recent years, cross-sectional growth curves have been drawn up for a number of archaeological populations in Britain, in which the diaphyseal length of the six major long bones of the body have been plotted against dental age. The extent of growth retardation of a population may be estimated by comparison with modern Western growth studies (such as Maresh, 1955). In addition, it is hoped that secular trends in growth may be identified through comparison with populations of different antiquity. However, because until now no contemporaneous British populations have been compared, it is not known whether any one skeletal sample may be regarded as representative of the wider British population of that time. Can a generic growth curve for a particular time period be constructed on the basis of one population, or do local social and ecological factors introduce too much variation between contemporaneous populations to make such a curve untenable?

In this study, cross-sectional growth curves of the immature skeletal remains of the Late Anglo-Saxon/ Norman population of Blackgate, Newcastle-upon-Tyne, were compared with those of five other archaeological populations, Hoppa's (1992) work on the contemporaneous Late Anglo-Saxon population of Raunds Furnells, Northants being of particular interest. It was found that the Blackgate population suffered significant growth retardation when compared to modern western standards. However, despite high prevalence of dental and skeletal stress markers, Blackgate showed the least retardationof the six populations compared, including Raunds. This would suggest that no generic growth curve for the Late Anglo-Saxon period could be constructed from these two studies, and that considerably more growth studies need to be undertaken before there is any attempt at identifying secular trends in growth, and thereby, the general health of British populations in the past.

Hoppa, R.D. 1992. Evaluating human skeletal growth: an Anglo Saxon example. *International Journal of Osteoarchaeology* 2: 275-288.

Mareshh, M.M. 19955. Linear growth of long bones of extremities from infancy through adolescence. *American Journal of Diseases in Childhood* 89: 725-742.

Gilly Carr

Ambiguous bodies and hybrid identities in Early Roman Britain

Session: Social Reflections

In the later Iron Age and early Roman period, native Britons slowly started to adopt some aspects of Roman-style culture in the way that they constructed and expressed their identities. Fundamental to this was their mode of appearance. Some native Britons of the south-east started to change their appearance by the use of Roman-style hairpins and toilet instruments, creating an identity that was neither wholly Roman, nor native, but a hybrid of the two. Was this simply yet another facet of Romano-British culture, or a case of deliberate ambiguity?

At the same time, similar blurring and ambiguity can be seen in the funerary record. One of the recognised treatments of the dead of central southern Britain, from the late Bronze Age until the middle Iron Age, is the practise of excarnation by exposure. This was replaced by cremation in the later Iron Age and early Roman period. What caused this change and how radical was it? If we take the opposite approach, and examine the evidence for continuity rather than change, recent excavations and research have shown us that the boundary between the two practices was not as sharp and distinct as once thought. Much overlap and blurring exists, with excarnation continuing into the Roman period and an extended exposure of the dead before cremation.

This paper will thus discuss the ambiguity and hybridity of both social identity and the mortuary record at this crucial period of cultural change.

Margaret Clegg

Not so dumb after all: the evolution of the human vocal tract

Session: Palaeopathology/Open

During the course of human evolution a major re-organisation of the upper respiratory tract appears to have taken place. This re-organisation is easily observed when humans and other mammals are compared. All mammals, including non-human primates, have larynges that are positioned high in the neck, with the epiglottis and soft palate in close approximation. Adult humans on the other hand have larynges that are positioned low in the neck with a wide separation between the epiglottis and soft palate. This morphological difference is often described as resulting from the selection pressures for the production of human speech sounds. Furthermore, this low laryngeal position in humans is regarded as confering a functional disadvantage on us in the form of choking to death on the food we eat.

Evidence will be presented to question these and other commonly held assumptions regarding the morphology of the vocal tract and possible selection pressures resulting in the descent of the human larynx. No support was found for the hypothesis that the ability to produce speech sounds was the main selection pressure for laryngeal descent. Nor was the cost of this descent high as commonly supposed. A model of laryngeal descent in earlier hominins based on this and other evidence will be presented.

Mathew Collins, Darrel Maddy and Kirsty Penkman

Racemization dating: La Jolla or a jewel of a method?

Session: Re-Animating the Dead

How useful is amino acid racemization (AAR) as a tool for refining chronology? The method is used with success by many Quaternary geologists as well as in forensic science, yet most anthropologists, and some Quaternary geologists view the method as unreliable at best. In our view the problems with the method have been overplayed, and can be traced to a limited number of rogue AAR values, notably the dating of a Palaeoindian skeleton from La Jolla. In Quaternary geology, the use of multiple species and lithostratigraphic controls has meant that chronological frameworks are more robust. Inconsistent ratios are recognised, but the reasons for them are not understood. We believe that we can go further and provide a more robust method of AAR which includes an assessment of the data quality of each analysis.

Our approach arises from a theoretical investigation of AAR and protein decomposition. Racemization kinetics in shells do not conform to first-order reversible reactions. Our modelling results suggest that (i) diffusive flux contributes significantly to the non-linear behaviour in shells; (ii) there is a selective bias towards loss of the most highly racemized components; (iii) protein trapped within the biomineral (the intra-crystalline pool; ICP) is the major contributor to measured D amino acids in molluscs. Measured AAR values in models of leaky systems are very sensitive to flux, closed systems are more reliable, as AAR of eggshell demonstrates. The presence of an ICP in molluscs has been suggested by preliminary experiments using prolonged NaOCl treatment of powdered shell. A further benefit of a closed system is that all the reactants and products are trapped. This means that increasing racemization corresponds to predictable decreases in the concentrations of bound and free amino acids. The range is surprisingly narrow across all biomineral types for which we have data. Values outside this narrow range indicate that the system has either been breached or contaminated. By measuring both free and total AAR values for each shell we can develop a means of internal validation, which we call the degradation model kinetic, or DMK. This can potentially be extended to include relative concentrations and AAR values of different amino acids. Returning to La Jolla - if we re-examine the source of the controversy using our understanding of kinetics - did he get it right after all?

Chris Deter

Dental wear patterns of hunter-gatherers and agriculturists: The direct human impact of human behavioural changes accompanying this transition

Session: Macrowear, Microwear and Molecules

Hunter-gatherers have a characteristic pattern of dental wear that is very different from that of agriculturists. Although the patterns vary between big game hunters and broad-spectrum foragers in relation to differences in diet, and the various uses of teeth as tools, they all share common features:

- High occlusal wear rate (relative to independent age indicators)
- Strong gradient of wear with heaviest at the front of the jaw and lightest to the back of the jaw
- Heavy approximal wear relative to occlusal wear
- Slow rate of change in the angle of occlusal wear plane in the molars

It is these features that make the wear patterns distinct from agriculturists. The project is designed to show changes in dental wear patterns due to the changes in subsistence strategies. This study will research the direct human impact of behavioural changes that can be seen to accompany this transition. The Archaic (dating from 7000BP - 4000BP) skeletal samples used in this study are from the Ohio River Valley in Kentucky; Woodland (dating from 3000BP – 800BP) samples are from a variety of different sites in Florida, Virginia, and Maryland. The transitional group or the Mississippian (dating from 4000BP – 3000BP) samples are from Indiana. The total number of individuals in the study is 901, which break down to 823 adults, 31 adolescents and 47 juveniles. From the preliminary results it was found that tooth wear in the hunter-gatherer samples had greater occlusal surface wear from back to front relative to age, greater approximal facets, and less angle on the first molars. The agricultural samples showed less wear of the occlusal surface relative to age, smaller approximal facets and greater angles in the first molars.

Linda Fibiger

Back in action -a study of lumbar spondylolysis as activity-related lower back trauma

Session: Posters

Lumbar spondylolysis is an activity-related stress fracture of the *pars interarticularis*. Its diverse skeletal expression, frequency and relatedness to skeletal robusticity, asymmetry, degenerative vertebral changes and other traumatic lesions were examined in six skeletal assemblages from Britain. These include a 5^{th}-6^{th} century settlement, a 15^{th} century mass grave, a 14^{th}-17^{th} century rural parish, a Medieval Dominican Friary, a Medieval Leper hospital and an 18^{th}-19^{th} century crypt collection.

Morphological features of the defect demonstrated the potential for symptoms in at least 30.77 % of individuals with the defect. A detailed study of all lumbar vertebrae in one of the assemblages highlighted discrepancies between clinical prevalence rates for spondylolysis established through radiography and those resulting from direct osteological analysis of the lumbar region of the vertebral column.

Only the male Chichester group presented a sufficient number of individuals with spondylolysis (n=13) for valid statistical intra-population comparison. There was no statistically significant difference in robusticity, asymmetry, degenerative vertebral pathology and evidence of additional traumatic lesions between those affected with spondylolysis and controls without the defect. Prevalence of additional traumatic lesions in the overall spondylolysis group, however, was significantly higher than in the overall control sample ($\div^2$=11.730; $p<0.05$).

The diverse skeletal expression of spondylolysis, its relationship with other traumatic lesions and sex-differences in its distribution emphasise the pivotal role of activity and mechanical factors in the occurrence of the defect. At present, the positive identification of repetitive habitual or strenuous activity patterns in osteological analysis remains elusive. The careful interpretation of activity-related, traumatic lesions like spondylolysis, however, can still contribute significantly to the understanding of biological, social and environmental mechanisms that influence skeletal health and morphology within a population.

Charlie Frowd

A holistic, evolutionary face identification system (EvoFIT)

Session: Re-Animating the Dead

Feature-based approaches that create composites (pictures of suspects to a crime, as seen on *Crimewatch*, etc) are common in criminal investigations and involve the assembly of individual facial features (e.g. eyes, nose and mouth). Despite computerization thereof, research has indicated that identification is poor when composites are created from memory. Interestingly, there is a significant body of data suggesting that we perceive faces holistically. This notion appears to be at odds with current composite systems due to the focus on individual features. The new approach under development (EvoFIT) contains a pair of inherently "holistic" face models, constructed with Principal Components Analysis (PCA), that describe facial intensity (eigenfaces) and shape (eigenshapes). This parameterized model is able to produce photographic quality and realistic-looking faces. To create a composite, an evolutionary mechanism is used whereby similar-looking faces are selected and bred together. This paper will summarise problems with current composite approaches, detail the underlying face model (PCA) in EvoFIT and outline some recent findings.

Tina Jakob

A palaeopathological assessment of Early Medieval non-adults from English and German skeletal samples

Session: Palaeopathology/Open

The palaeopathological analysis of non-adult human remains is neglected compared to studies of adult pathologies. This is due to several factors: the number of non-adult individuals recovered during archaeological excavation is generally low, bones are in a poor state of preservation and certain diseases – such as joint disease – are generally more likely to occur in older individuals. Nevertheless, it is felt that the study of non-adult remains contributes to the understanding of past societies. In this presentation two non-adult samples from Early Medieval England and Germany (mid 5th-late 7th century AD) are analyzed and compared with each other to gain information about their health and disease status. A total of 204 relatively well preserved individuals aged below 18 years were available for demographic analysis revealing different mortality patterns between the two countries. Skeletal lesions are limited to cribra orbitalia, non-specific infection, osteochondritis dissecans as well as Schmorl's nodes. Frequencies of cribra orbitalia were significantly higher in the German sample with more children showing active forms of iron-deficiency anaemia. Dental pathologies display similar levels of calculus formation, but again more German children suffered from dental caries.

Mandy Jay

Iron Age diet: stable isotopes from Wetwang, East Yorkshire

Session: Posters

Human and animal bone, from an Iron Age site in East Yorkshire, has been sampled for analysis of carbon and nitrogen stable isotopes from collagen, for the purpose of dietary reconstruction. Iron Age burials are rarely found in large groups, but the 'Arras' tradition of the area provides a unique opportunity to study large cemetery sites and this particular burial ground contains over 400 interments. An associated occupation area means that animal bone is also available for analysis, this being an important part of the study, providing necessary 'baseline' data for the interpretation of the results.

The burials allow comparisons between diet across groupings relating to sex, age, burial phase and apparent status. Amongst the interments are five vehicle burials ('cart' or 'chariot' burials). These and other 'higher status' burials are interred beneath square barrows with surrounding ditches. Lesser status is implied for interments in flat graves, secondary burials, those within ditches and fragments of human bone found amongst animal bone contexts. Ages range from foetal through infants to adults in the older age range. John Dent, who directed the excavation of most of the burials, has suggested four possible burial phases, although a division into two (Early and Late) can be applied with more certainty.

Comparison of the data between these groups will identify dietary differences relating to animal, vegetable and marine protein inputs, answering questions such as whether men and women were eating the same amount of meat. Use of the animal results will aid a reconstruction of the overall dietary picture for this time and location.

Chris Knüsel

The second horseman of the apocalypse: of boastful warriors, holy blissful martyrs[1], and cruel avengers against their enemies[2]

Session: Social Reflections

Many treatments of warfare in pre and proto-history often falter due to the perceived ambiguous nature of evidence for armed conflict, even in societies with documentary evidence relating to violent encounters on a grand scale. These treatments are often based principally on the occurrence of defensive sites, such as fortifications and ditches, the presence of weapons, such as projectile points and wooden spears and later metal weaponry, and burials provided with weaponry. Many of these, though, can be seen to be as much a social statement about the prestige and social standing of the builders or buriers and, perhaps, even as a prophetic warning against attack than as secure evidence for warfare. Even broken weapons or flint projectiles are not unequivocal evidence of warfare, as breaking or fragmenting objects is a part of many funerary rites and other ceremonies (Chapman 2000). If warfare is as endemic in recent small-scale social groupings as Keeley (1996) has demonstrated, then why is there such a seeming paucity of evidence for it in a past dominated by similar social groupings? Since physical evidence of wounds, fatal or healed, is the *sine qua non* of warfare and its results, then it is to the skeletal remains that one must turn. The context of remains bearing peri-mortem injuries provides for a re-interpretation of multiple burials from the past, the significance of which may have been overlooked. Examples of perimortem injuries and their context are presented in an attempt to better substantiate the nature and extent of violence in the past.

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[1] The epithet applied to Archbishop Thomas Becket's tomb from Geoffrey Chaucer's *Prologue*, (Ll. 16-17)

[2] From Géoffroi de Charney's *Livre de Chevalerie* (1350 A.D.) (Book 23, Ll. 4-5)

[1] The epithet applied to Archbishop Thomas Becket's tomb from Geoffrey Chaucer's *Prologue*, (Ll. 16-17)
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Jon Le Huray

Diet and social stratification in Iron Age Bohemia: initial data from Kutná Hora – Karlov, Czech Republic

Session: Macrowear, Microwear and Molecules

Studies utilising bone chemistry techniques have, on the whole, focussed on the consumption of foodstuffs and its meaning in a functional sense, e.g. the identification of an agricultural lifestyle or the determination of the relative importance of marine foods. To date, little work has been done to place this information into a social context in terms of differential access to dietary components. This approach provides a powerful analytical tool to identify patterns of social stratification as reflected in diet-related bone chemistry data. It thereby complements traditional methods of assessing dietary information, such as the study of animal and plant remains, and of examining social differentiation, such as the analysis of grave goods and burial practices, as well overall health in terms of palaeopathology.

The development of a new pattern of social organisation in Bohemia during the second phase of the Iron Age still remains largely unresolved. At some point during the 5th century BC, a warrior aristocracy emerged throughout Europe replacing the existing order characterised by hill-forts, ‘elite’ burials, and extensive trade with the Mediterranean. Burial evidence seems to indicate a less marked hierarchical society than in the preceding Hallstatt period.

Initial data indicating social differentiation through dietary patterns is presented, in combination with traditional archaeological and osteoarchaeological data to help understand patterns of social stratification in the La Tène period of Bohemia.

Gabriele A. Macho

The phylogenetic relationships and functional adaptations of Plio-Pleistocene hominins

Session: Macrowear, Microwear and Molecules

Early hominin fossil remains are rare and fragmentary, while cultural remains are virtually absent from the Plio-Pleistocene. This compounds inferences about the phylogenetic relationships, behaviour and life histories of extinct species. Teeth, commonly preserved in the fossil record, are an ideal structure for the study of hominin evolution. From a phylogenetic and ontogenetic perspective, they form in an incremental manner and preserve a permanent record of their development. From a functional perspective, they are involved in the mechanical breakdown of food and, therefore, provide information about the dietary niche of the species. With this in mind, naturally broken teeth (and high-resolution casts) of Plio-Pleistocene hominins from South and East Africa were analysed with regard to the developmental processes (i.e., movement of ameloblasts) underlying tooth formation in these species, and the functional implications this may entail.

In primates, amelobasts (i.e., enamel secreting cells) generally take a sinusoidal course in a horizontal plane as they move from the dentino-enamel junction to the outer enamel surface, although there are differences between species (and within and between teeth). The differences between hominins are marked, however. Notably, whilst *Australopithecus africanus* grows its teeth in a manner resembling that of modern humans, *Paranthropus boisei* exhibits a pattern of tooth formation not seen in any other primate studied thus far. While differences in developmental pathways provide insights into phylogenetic relationships, the enamel microstructure thus obtained will also affect the way in which the teeth can function. Towards an understanding in this area, we have developed a graphical model using C^{++} programming language which allows advanced OpenGL graphics applications. This approach enables us to recreate and visualise the different prism arrangements interactively and in real-time. Furthermore, these graphical models can be transferred to Finite Element models and subjected to stresses and strains in order to evaluate their biomechanical behaviour. From our preliminary analyses it is evident that both the fracture potential and abrasion resistance of teeth differ among hominins more than previously assumed.

This study is supported by The Leverhulme Trust (F/00 025/A)

Brooke Magnanti

Data analysis through automatic tools

Session: Re-Animating the Dead

A sample of human cranial data taken from the Sheffield and Bradford archaeological collections is analysed using a series of statistical methods. Sexing of the crania is approached with a combination of Generalised Procrustes Analysis (GPA) and Hotelling's T^2 test; this is compared against a new method using Support Vector Machines and Kohonen self-organising maps. The data are further examined for studies in interobserver error. A description of the tools as they are developed, and eventually the tools themselves, will be made available online.

Patrick Mahoney

Human dental microwear during the development from a hunter-gatherer to an agricultural economy in northern Israel: preliminary results.

Session: Macrowear, Microwear and Molecules

The hunter-gatherer to agricultural development in Israel is arguably one of the most heavily researched prehistoric dietary developments. Yet, much that is known about human diet during this period has been inferred from archaeological and environmental evidence. This evidence has provided insights into the food that was available for consumption.

This study is about the microscopic marks on prehistoric human dental tissue from the period of dietary development. These marks are a permanent record of what was actually consumed. Microwear analyses may therefore contribute further dietary insights.

Dental microwear was investigated in two successive archaeological dietary groups from northern Israel: Natufian (hunter-gatherer) and Neolithic (agricultural). Dental microwear at the bottom of facet 9 on the 2nd mandibular molar (n=60) was examined with a Scanning Electron Microscope. The bottom of the facet was chosen because preliminary analyses demonstrated that this dental location optimised the microwear differences between the groups.

Several significant differences were detected between the dietary groups. Dental pits were larger (length and width) in the agricultural group. In addition, dental scratches became wider and more frequent in the same group. The inter-group comparison may indicate that a change in dietary texture and abrasiveness accompanied the dietary development.

Research sponsored by the AHRB. Travel grant provided by the CBRL.

Xanthé D.G. Mallett

Ontogenetic lead accumulation

Session: Re-Animating the Dead

Lead is sequestered by calcified tissues, the tissues' content being a cumulative function of previous exposure. It is therefore possible to monitor both long-term exposure to the element, and model changing supply of pollution throughout an individual's lifetime. Although dental tissues in general are used, enamel is especially convenient for trace element research as it is formed during known stages of life, is chemically stable, and is the tissue most resistant to diagenesis.

Lead is known to be toxic, even in minute quantities, many studies having concentrated on the atmospheric lead burden and how this relates to human exposure. This complicated relationship remains unclear, however, and the necessity arose to establish a base-line for human exposure from natural sources. The effects of diagenesis and contamination further complicate studies of this nature, due to the lack of understanding of these processes. The ideal sample source would therefore not have undergone burial or other forms of contamination. For these reasons a fresh pig's mandibular dentition was chosen.

The methodology employed utilises inductively coupled plasma mass spectrometry for solutions, coupled with laser ablation for solid samples. The study represents the first in which an entire dentition from a single individual is analysed with this combination of techniques, thus providing a full lead concentration profile comparable with modern epidemiological studies, and a fingerprint of lead abundance for a single tooth.

The results demonstrate consistent enrichment of ^{208}Pb within the outer 30μ of the enamel and a strong, positive relationship between eruption sequence and lead concentration, supporting the conclusion that this phenomenon is unrelated to diagenesis and is a result of the original process of tissue formation in vivo. The results are significant, both with respect to the conclusion that ontogenetic lead intake can be monitored in incremental layers, as well as the suitability of the pig model.

Melissa Melikian

A case of metastatic carcinoma of the breast from 18th century London

Session: Posters

In 1999 AOC Archaeology Group excavated the cemetery of All Hallows by the Tower prior to redevelopment. Approximately 350 burials were excavated, three of which date to the Saxon period. The remaining burials are post-medieval dating from circa 1776 to 1835. Skeleton (4105) was buried in a wooden coffin with a lead coffin plate. The data on the coffin plate revealed that the skeleton was that of Anne Sumpter, who died aged 31 years on the 25th May 1794. The skeleton displays pathology that is indicative of a metastatic carcinoma. Precise diagnosis is not possible but considering the sex and age of the individual a likely diagnosis is primary carcinoma of the breast with skeletal metastases. The individual displays circular, clear cut lytic lesions at a number of foci. These vary in size ranging from 2 to 12 mm with a number perforating the bone. They are most frequent on the skull and the vertebrae.

P.D. Mitchell, J.P. Huntley and E. Stern

Dietary modification as a medical treatment in the Medieval hospital: evidence from the 13th Century latrines of the Crusader Hospital of St. John at Acre, Israel

Session: Macrowear, Microwear and Molecules

Mediaeval medical texts routinely advise dietary modification as a treatment for the sick. However, to date there has been little archaeological evidence to show whether this technique was actually practiced. This study compares the 12th-13th century diet of the Frankish population of the Kingdom of Jerusalem, the evidence for diet in hospital patients from excavation of the 13th century latrines of the Hospital of St. John in Acre, and contemporary dietary regulations for the sick in the statutes of the Order of St. John.

Remains of foodstuffs recovered from the latrines include the grains and pollen of cereals, fruit stones, the scales and bones of fish and the chewed bones of mammals. Legumes were also recovered from warehouses in the same complex, but not from the latrines themselves. The diet consumed by patients in the hospital differed significantly from the diet consumed by the general population. Comparison of the latrine results with the dietary regulations of the order shows close correlation between foods encouraged and foods forbidden to the sick. This suggests that those hospitals of the Order of St. John that actively treated the sick with medical techniques may have been strictly employing treatments such as dietary modification in an attempt to improve the health of their patients.

Gundula Müldner

Fast or feast: social differences in Later Medieval diet by stable isotope analyses

Session: Posters

It is often suggested from the literary evidence that status differences in medieval Europe were expressed through unequal access for the elites to meat and fish in an otherwise cereal-based diet. Research into prehistoric diet has shown successfully that these dietary differences should be detectable by stable isotope analyses of human bone. If dietary variation can be established by isotope analyses, bone chemistry data could be used for the internal differentiation of medieval cemeteries, where the uniformity of the funerary rite and the usual absence of grave-goods make it often very difficult to infer status from the burials.

This poster presents the results of a pilot study, applying stable isotope analyses of carbon and nitrogen from bone collagen to three medieval sites in Northern England. Results suggest significant differences between diet in the later Middle Ages and earlier periods, as well as between the three sites and isotope data obtained from the medieval rural settlement of Wharram Percy. Dietary variation between and within the three sites is discussed and interpreted within the historical context. Ongoing further research is outlined.

Kurt Prangenberg

MM-wise sampling provides new insights into bone chemisty

Session: Posters

A new sampling tool allows precise depth-dependent sampling which allows us to monitor the distribution of chemical and physical parameters in bone. We here present normal distributions of organic matter and compare them to altered/contaminated distributions in modern and archeological bone.

Rebecca Redfern

Painful and infectious - life in Iron Age Dorset

Session: Social Reflections

This paper examines the palaeopathological evidence from Iron Age Dorset, following the analysis of several cemetery sites, including Maiden Castle, Gussage All Saints and Whitcombe. The paper will intepret the results using a biocultural approach, in order to understand the evidence for life-ways of both sexes and children, focusing upon inter-personal violence, warfare, secondary burial practice, infectious and metabolic diseases and stress indicators. Results so far have supplied important information on subadult health, different trauma patterns for men and women, the transmission of infectious diseases between animals and humans, and differential access to healthcare.

Jill A. Rhodes

Humeral torsion and activity-related change in the human upper limb: towards an appreciation of skeletal plasticity and adaptation

Session: Palaeopathology/Open

Repetitive movement of the upper limb during growth may lead to soft tissue and skeletal adaptations. Variations in humeral torsion have previously been identified clinically in professional handball players (Pieper 1998), as well as archaeologically, in a group of robust, blade-injured individuals from the Battle of Towton (1461 AD) (Knüsel 2000). This project investigates humeral torsion as a measure of shape and its potential as an osteogenic response to mechanical loading.

Preliminary findings show humeral torsion varying significantly between and within populations with contrasting levels of activity and social status. Investigation of the Fishergate blade-injured population (10^{th}/11^{th} century) and the Towton blade-injured population (15^{th} century) show significant differences in humeral torsion, indicating a probable change in combat methods or other activity variants from the early to later medieval period. Humeral torsion is demonstrated to be an adaptation in shape rather than robusticity and thus may be seen as an accommodation to habitual activity and, as such, may be further analysed to determine movement patterns.

The clinical analogy seeks to determine movement patterns through comparison, with the blade-injured individuals serving as proxy for those engaged in habitual, strenuous activity. Similar movement patterns exist between medieval combatants engaged in unimanual activity and in overhead throwing with force, as in baseball pitchers. Indicators of repetitive stress and strain along with strong directional asymmetry are sought as part of this analogy. The results of this analysis demonstrate strong phenotypic plasticity within humeral form.

Knüsel CJ. 2000. Activity-Related Skeletal Change. In: *Blood Red Roses, V.* Fiorato, A. Boylston & C. Knüsel (eds.). Oxbow, Oxford. Pp103-118.

Pieper HG. 1998. Humeral torsion in the throwing arm of handball players. *American Journal of Sports Medicine* 26:247-253.

John Robb and Kostalena Michelaki

What do paleopathology rates actually mean?

Session: Re-Animating the Dead

The relation between true disease prevalence and paleopathology rates is far from transparent. Paleopathology rates are influenced by many variables. These include, among others, sample bias and preservation, age structure of the population, age-related probability of contracting a given disease, age-related probability that a given disease will leave a visible marker, duration of the marker before it resorbs, and whether or not the disease actually contributes to the risk of death. Unless we understand the effect these variables have and their interaction, we have no way of knowing whether paleopathology rates in a particular sample represent disease realistically or not. This research explores the relation between paleopathology rates and these variables through computer simulations in which each variable can be varied independently and the resulting paleopathology rates can be compared. The results show under what circumstances paleopathology rates can be reliably interpreted and what steps osteoarchaeologists need to take to do so.

Marianne Schweich

Stature, body proportions, and social inequality in European archaeological populations

Session: Social reflections

Stature and body proportions of humans are influenced by factors of the natural environment, such as climate, altitude, and latitude. However, since humans are cultural animals, bio-cultural factors, such as social, economic, and political status, general health, and nutrition, have a noticeable influence on stature and body proportions. These bio-cultural factors leave a distinct signature on human skeletal remains, which is observable in archaeological skeletal material.

Populations from sites such as known leprosaria and medieval hospitals, rural and urban parish cemeteries, monastic cemeteries, and victims from the battle of Towton in A.D. 1461, are analysed and compared to very high status individuals, such as the medieval emperors Charlemagne, Heinrich IV, Heinrich V, and Queen Beatrix of Brabant, as well as modern population averages. The data from the archaeological populations are viewed within their environmental, cultural, social, and economic context, to test for effects of social distinctions in state-level societies, effects of peasant life on growth attainment, and how the transition from less centralised early medieval societies to later medieval states affected growth. First results show a relationship between socio-economic status and body proportions, weight-to-height ratio, sexual dimorphism and general stature from Roman times to the post-medieval period. Stature and body proportions from human skeletal remains provide a time depth by which to study socio-economic inequality, thus extending documentary sources of more recent date.

Bill Sellers

Using gait morphing to reconstruct the locomotion of early hominids

Session: Re-Animating the Dead

It used to be sufficient to reconstruct static representations of fossil hominids but nowadays there is a growing demand to produce animated models for educational and entertainment purposes. In much the same way as early skeletal reconstructions were based more on artistic interpretation than on anatomical evidence current animation techniques are largely guided by what looks right to the animator. Biomechanical simulation can be used to help produce gait patterns that are mechanically plausible however previous work on early hominid locomotion has shown that simply imposing the gait pattern from a modern hominoid does not work. The results are unstable because the differences in segment dimensions mean that the imposed gait is inappropriate and the simulation rapidly falls over. By using morphing techniques we can create a series of intermediate body shapes between our starting point (a modern human) and our finish point (*Australopithecus afarensis*).

Human gait is imposed on the first morph and since the difference in body shape is small this gait pattern will be a reasonably good fit and can be optimised to the new morph relatively quickly. This procedure can then be repeated for subsequent morphs until a gait is generated for *A. afarensis*. This allows an incremental change in the gait pattern concurrent with the incremental change in the morphology so that the large ultimate difference between the model and target body shape can be accommodated by a series of much smaller changes allowing a stable gait pattern to be produced for our target hominid. The gait patterns still need to be adjusted at each stage and this is achieved using a genetic algorithm based optimisation procedure that maximises the energy efficiency of the locomotion. This produces a realistic-looking, smooth gait with minimal extraneous movement although because of restrictions in the biofidelity of the simulation it tends to produce fairly slow walking speeds. Ultimately this modeling procedure could also allow for arbitrary shape changes or joint mobility restrictions which means that it could be used in the wider reconstruction context to produce individual specific locomotion or to predict the gait change associated with pathological lesions.

Rick Steckel

A history of health in Europe from the Late Paleolithic era to the present: brief description of a research project

This project gathers data to reinterpret the history of human health in Europe from the late Paleolithic era to the early twentieth century, a time period in which human health was transformed enormously by the transition from foraging to farming; the rise of cities and complex forms of social and political organization; European colonization; and industrialization. With a trans-Atlantic network of collaborators (most of whom will be from Europe), the project will gather and analyse skeletal measures of health from 40,000 individuals who lived in Europe over the past 10,000 years. Specific information collected from skeletons housed in numerous European museums includes: age at death; sex; stature inferred from long-bone lengths; dental decay; degenerative joint disease; trauma; skeletal infections; and the occurrence of specific diseases such as tuberculosis, rickets, and leprosy. Project researchers will also scour the published and the grey literature of site reports that contain information on the heights of 100,000 men and women. When combined with ecological information to be collected, the data will have numerous uses, including studies of: (1) health, climate and habitat; (2) health and the transition to farming; (3) the social and economic causes and consequences of long-term changes in health; and (4) the health of women and children.

Judi Sture

Developmental defects in medieval England: evidence of environmental influence

Session: Palaeopathology/Open

Excavated human materials from five English Medieval urban and rural cemeteries were examined for the prevalence of specific developmental defects of the axial skeleton. We wished to identify an underlying defect rate in English pre-industrial populations. From a total of 1440 partial or complete skeletons with the relevant bone elements, 445 individuals were found to have one or more developmental defects present (30%). Using chi-squared analysis, statistically significant differences between the prevalences of certain defects were observed between rural and urban cemetery populations (at 95% CI or higher). Defects originating in the paraxial mesoderm developmental field between days 21 – 30 of gestation appear to be the most susceptible to environmental interference. The urban Hull site appeared to mirror a "rural" pattern of defect prevalence, raising questions about access to burial in the Friary. The other two urban sites (Chichester and York) showed significantly higher defect rates than the rural sites (paraxial mesoderm field). As the English population was genetically homogeneous, we suggest that these differences may be due to environmental factors experienced by the populations both before birth and during childhood, as well as during the reproductive years. It is suggested that the health hazards associated with urban populations may be responsible for this phenomenon. The authors suggest that disruption of the infection – nutrition relationship associated with raised population density has an adverse effect on the reproductive health of urban populations, and may be a significant cause of skeletal defects in today's populations as well as those in the past.

M. Tafuri, J. Robb, M. Mastroroberto, L. Salvadei and G. Manzi

'Marrying in and eating out': Trace element analysis and social mobility in a Southern Italian Bronze Age community

Session: Social Reflections

Italian prehistorians have traditionally assumed that Bronze Age societies were organised as patrilineal and patrilocal mobile pastoral groups. However there is no archaeological evidence *for* or *against* this view, as pottery studies and osteoarchaeological investigations often entail technical and theoretical limitations. Trace element analysis of human bone and dental enamel from the Middle Bronze Age cemetery of Sant'Abbondio (Pompeii, Southern Italy) are used to investigate social and economic mobility (i.e. marriage exchange, migration, seasonal transhumance etc.) through the different histological nature of these two tissues; bone represents elemental uptake during the last decade of life and dental enamel is informative of chemical build-up during childhood. Possible discrepancies between the two tissues could reflect mobility as an explanation of divergence between early and late chemical life. Multi-elemental analysis is useful for the complex, multi-dimensional patterns of social mobility.

In this sample, a number of interesting patterns emerge. A primary metabolic/biological differentiation involves age and sex. Comparative analysis of bone and enamel reveals that extreme elemental values in bone composition prevalently involve males, while extreme values in enamel composition tend to involve females; this may suggest gender related differences in personal mobility, with females more likely to differ from the overall group in their original chemical environment and males exposed to more varied environments within their adult life. A second pattern is that of elemental differences in bone and enamel composition within the group, which suggests that a subgroup of females buried in the western half of the cemetery differed from the overall group in terms of diet, origin or lifestyle. Further archaeological and anthropological analyses may clarify the nature of this difference.

Sarah P. Tatham

Diseases and injuries in medieval Rouen

Session: Social Reflections

Over 500 skeletons were excavated in the 80s and 90s by Jacques Le Maho from the medieval burial grounds surrounding the cathedral of Rouen (Normandy), spanning from the end of the ninth to the beginning of the fourteenth century. 378 adult individuals from the tenth to twelfth century were analysed recently with special emphasis in paleopathology.

Trauma was abundant with mostly healed fractures and dislocations, sword cuts to the skull (both healed and unhealed) and a case of epiphyseal dysplasia of the proximal humerus. A few cases of tuberculosis with severe spinal lesions and Pott's disease showed evidence of chronic infection. Congenital malformations were also present, with dislocations of the hip, Perthes disease, kyphosis and a case of agenesis of the centrum with resulting kyphosis.

The spread and variety of disabilities is probably expected in a city of considerable importance throughout the medieval period. Rouen was a powerful centre for trade, religion and politics. No doubt it would have attracted disabled individuals who probably could not care for themselves and relied on family and charity to survive. We have no historical or archaeological reports of a charitable institution that might have taken care of these individuals. The burials spread across the periods and are not localised, which suggests that there was no formal structure of care such as a hospice, which were developed in the thirteenth century.

Tim Thompson

Re-animating the dead: keeping statistics real

Session: Re-Animating the Dead

In order to contextualise ongoing doctoral research into the influence of burning on the human skeleton, a retrospective study of fire-related deaths has been undertaken. The aim of the study is to examine patterns of fire-related death in the region of England that falls within the jurisdiction of the Medico-Legal Centre, Sheffield. 11,889 post-mortem reports of individuals whose deaths were investigated by the forensic pathologists of the MLC between the years 1991 and 2002 were examined. 174 (1.5%) people were found to have died as a direct result of fire. Patterns were highlighted using statistical analyses, and the results are presented here.

Although superficially, this retrospective study may not be of immediate relevance to most anthropologists and archaeologists, three important conclusions will be. First, anthropological research requires a suitable context, that is it needs to be able to be related back to people. Second, that statistical analyses are not just about number-crunching, they are about the analysis of people and their lives. Third and finally, the soft and hard tissues of the human body do not exist in isolation, they are a unified system and need to be treated as such.

Philip Vidal

Palaeoepidemiological study of DISH in the east of France

Session: Palaeopathology/Open

We studied human remains found in four cemeteries from the early middle Age (VIth to VIIIth century) located in the Lorraine district of eastern France. From the original sample (430 subjects) we selected 99 individuals whose spines was entirely or extensively preserved. We used classical criteria adapting to the specific needs of palaeoepidemiology. DISH occured in our populations with a prevalence of 5.6 to 7.4%. Males were more often affected than females. Anatomically, we found typical flowing ossification (like “candlewax“) of the anterior longitudinal ligament of the spine, between T8 and T11. At the lumbar spine, massive ossification was common but usually discontinuous. Ossifications involved the appendicular skeleton as well. Although ossifications can develop in any enthesis, some areas are selectively involved : acromion, humeral tubercles, olecranon, iliac crest, ischial tuberosity, and calcaneum. Osteoarthritis was seen at the hips, glenohumeral joints and elbows. The concomitant presence of these two diseases is common and suggests that DISH may be one of the causes of osteoarthritis. The prevalences in our sample were similar to those reported in contemporary studies (3 to 6%) and in mediaeval populations (3 to 8.6%). DISH appears to be associated with obesity and diabetes. Thus, it may reflect dietary factors and consequently, it represents a socioeconomic marker in ancient populations.

Efrossini Vika

Born with a silver spoon? Status ascription and dietary variation in a Bronze Age Greek cemetery

Session: Posters

Kalamaki is an Early Helladic (3100-2300 BC) cemetery on the Peloponnese, that was reused during the Mycenaean period. The cemetery consists of rock-cut tombs of various sizes and some exhibit unusual features such as benches. Coarse hand-made pottery forms the majority of the grave goods but there are also bronze pins, flint arrowheads and stone pendants. In this poster carbon and nitrogen stable isotope data from individuals from a number of these tombs are presented. This study was undertaken to give a general overview of eating habits over time (Early Helladic- Late Helladic) but more importantly to help approach the ideology behind them: are different burial treatments associated with different dietary patterns and what are the implications for the social distinctions?

Anna Williams

The Brain for Anthropologists

Session: Palaeopathology/Open

Biological anthropologists concentrate on improving their knowledge of the skeleton, often at the expense of their understanding of soft tissue anatomy. It is important to remember that the skeleton does not exist in isolation, and that there is a mutually influential relationship between the hard and soft tissues of the body. The brain is a good example of this, as it exerts a powerful influence over the skeleton in terms of its control over movement and sensation. However, in turn, it is influenced by the skeleton, as it is reliant on the skull for protection, and is particularly vulnerable to trauma if the skull is subject to fracture or applied force.

This presentation aims to outline the basic functional anatomy of the brain, from its lobes to its nerves, meninges, blood vessels, and ventricles. It will also highlight the relationship between the brain and its bony casing, the skull. This talk also aims to explore the relationship between the brain and the skeleton, by examining trauma – both the effect of skull trauma on the brain, and the effect of brain injury on the skeleton. It is hoped that this talk will go some way to addressing the problem of anthropologists lacking knowledge of soft tissue anatomy, and help an understanding of the interaction between the brain and the skeleton.