PAPERS ON PALEOPATHOLOGY

presented at the

Fourteenth Annual Meeting

1 and 2 April 1987

New York, New York
A. COMPUTER GRAPHICS SOFTWARE IN PALEOPATHOLOGICAL RESEARCH

Donald J. Ortner, Smithsonian Institution

Human skeletal paleopathology is limited by the inability to study soft tissue pathology and the lack of data on many other variables that are important in clinical diagnosis. There is, however, a significant advantage in that, through direct inspection of bone tissue, one can obtain detailed knowledge about bone lesions that is unlikely to be available in clinical x-ray films. Furthermore, careful analysis of the different types of lesions and their distribution in a paleopathological case provides insight about skeletal pathology that is rarely accessible in a clinical setting. A major objective for the paleopathologist is to make optimum use of the information available in the gross skeleton. In this context, computer aided design (CAD) software offers a valuable tool in providing a method of visualizing the distribution of various pathological conditions in a skeleton. It is also valuable for showing the relationship among different types of pathological conditions in an abnormal skeleton. Effective use of CAD software, however, requires standardization of descriptive nomenclature for both the type of abnormal condition and its location in the skeleton. This standardization does not now exist, and must be a major goal for skeletal paleopathology. To achieve this goal will require careful thought and extensive discussion between those who work with skeletal remains and those who have the clinical experience to relate the observations of the paleopathologist to modern medical terminology and practice.

B. DIFFERENTIAL DIAGNOSIS

Marc A. Kelley, University of Rhode Island, Sean T. Murphy and Paul Sledzik, Armed Forces Medical Museum

A dozen specimens from the Army Medical Museum in Washington were exhibited. They included classic cases of Paget's disease in the skull, syphilitic periostitis of the tibia (one modern and one ancient) and ulna (modern), osteosarcoma of the mandible, coccidioidomycosis of the distal tibia, actinomycosis of an ox mandible, and a heavily mineralized innominate that could have been mistaken for a lesion. Also on display were several enigmatic specimens. These included a fibrous swelling on a subadult mandible, extensive spicular periostitis (?) in one individual's feet, an unusual periostitic reaction on the outer table of a cranium, and a dense and swollen mandible (leontiasis ossea?) of an ancient specimen. There was spirited debate over the antiquity of syphilis and problems associated with differential diagnosis between Paget's, leontiasis ossea and fibrous dysplasia, but little consensus on the enigmatic specimens.
SECTION 2: FORENSIC PATHOLOGY AND PALEOPATHOLOGY ---
POTENTIAL INTERFACES

Convener: Frank P. Saul, with Peggy Caldwell and Leslie Eisenberg

SESSION SUMMARY

Frank P. Saul, Medical College of Ohio

Thanks to the cooperation of Elliot Gross, the Chief Medical Examiner of New York City, and the initiative of his forensic anthropology consultants, Peggy Caldwell and Leslie Eisenberg, the Association was provided with an ideal setting for a symposium on potential interfaces between paleopathology and forensic pathology, in terms of both meeting facilities and access to actual examples in the Morgue Museum. The papers presented and audience reaction to them supported our belief that both subtopics are of profound potential importance in both the ancient and modern context, and that each discipline has something to offer the other. As is usual, it would appear that we need to discuss these matters even further at future meetings.

PART I: CLINICAL-FUNCTIONAL SIGNIFICANCE OF SELECTED LESIONS

INTRODUCTORY STATEMENT

Frank P. Saul and Julie M. Saul, Medical College of Ohio

An earlier visit to the Morgue Museum in 1952 provided the initial impetus for FPS' interest in this subject, as he noted case after case of severe congenital malformation or previous horrendous injury that was recognized only after the functioning individual died in New York traffic* and was then autopsied. Later, our Maya and other studies yielded specimens such as an individual with a well healed but massive hacking wound, who needed to be functionally evaluated. A modern forensic case from Egypt (Smith, Mostly Murder) with old extensive skull injuries discovered only when autopsied after being stabbed in the heart provided us with a warning against overinterpretation of diminished function. In addition, Smith later stresses the importance of considering degree of function following disease or injury in relation to specific police cases. Some paleopathologic lesions, e.g. fractures, are relatively easy to interpret in terms of function, but others, e.g. cranial shaping, remain equivocal.

* Sceptics might respond with a derisive remark concerning survival of the fittest, but these people were moving about!
Modern cases demonstrate that profound damage (major portions of the skull removed by multiple 'primitive' surgeries) may produce little apparent dysfunction, whereas a seemingly small lesion, e.g. a torn tibial tuberosity like Osgood-Schlatters, can produce great pain and dysfunction.

We have begun collecting for publication modern cases of individuals with congenital, traumatic, and other disorders, using radiographs if bones and specimens are not available. We invite others to join us in this endeavor, because we believe that such a compendium will help us to avoid over- and under-interpretation of function in both paleo- and forensic pathology. Our speakers today provide a dramatic review of modern cases as we visit the Armed Forces Museum vicariously and the NYC Morgue Museum personally.

TRAUMA WITH SURVIVAL: CASE STUDIES FROM THE ARMED FORCES MEDICAL MUSEUM

Joan M. Macdonell, Paul S. Sledzik and Sean P. Murphy, Armed Forces Medical Museum

The Armed Forces Medical Museum, established in 1862 by Surgeon-General Hammond to provide study specimens for the Union surgeons, today houses anatomical collections that contain numerous Civil War specimens of trauma and disease. Many cases document severe trauma and remarkable survival, sometimes for decades, without the benefits of antibiotics, antiseptics, x-rays, or even cleanliness. One example is a Civil War major whose abdomen and ilium were penetrated by a musket ball, leaving him with a draining fissure completely through his body. He remained in action, between bouts of minimal treatment, was wounded twice more, promoted to Brigadier-General, and died of pneumonia 30 years later.

PART II: ATTEMPTING TO DISTINGUISH PRE-, PERI-, AND POST-MORTEM TRAUMA

INTRODUCTORY STATEMENT

Frank P. Saul and Julie M. Saul, Medical College of Ohio

This is a continuation of a subtopic that aroused considerable interest during a Knoxville breakfast meeting concerned with distinguishing between pseudo and real pathology. A brief series of ancient and modern problematic cases is presented to set the scene visually for our speakers' intensive analyses of two ancient populations and one very educational modern forensic case. Unfortunately, last minute problems prevented the presentation of contributions from taphonomy and electron microscopy that should someday aid us in this area.
ANCIENT EXAMPLES FROM BRITISH COLUMBIA

Jerome S. Cybulski, Archaeological Survey of Canada, Ottawa, Canada

This paper illustrates openings in skulls from two regions of the British Columbia coast, the northern coast Prince Rupert Harbour and the southern coast Gulf of Georgia. The majority have good prehistoric provenience, ranging from 1500 B.C. to A.D. 500. A few enigmatic holes are in skulls that may or may not be prehistoric, but are certainly aboriginal. Most of the openings may be ascribed to four causes: a) postmortem cultural modification; b) postmortem trauma; c) possible trephination; d) premortem healed and unhealed trauma. Although some of the lesions are superficially similar, they may be differentiated by fine details in conjunction with knowledge of the ethnohistory of the Northwest coast. The openings in the first group support B.C. tales of the ritual use of human corpses and skeletal parts, and are supported in turn by archaeological finds of bone pieces cut from human skulls, probably with sandstone saws. In the second group there are holes punched in the heads of slain enemies, taken in warfare and hung outside victors' houses. Aside from the fact that multiple holes often occur in such skulls, the openings may not be distinguishable from death-dealing club blows in skulls with unhealed single lesions as seen in the last group. In both cases, outer table 'step fractures' are a hallmark of fresh bone perforations, and the inner table shows signs of having been torn away from the opening. In the last group, however, skulls show a cross-sectional array of the likely results of depressed fractures, probably from certain kinds of stone clubs, and range from small indentations to large comminations. Although as many as nine purported cases of trephination have been published for British Columbia, only two skulls, one unpublished, tend to withstand diagnostic scrutiny by showing striae together with signs of healing.

HUMAN BONE DAMAGED AT OR SHORTLY AFTER THE TIME OF DEATH: EXAMPLES FROM A LATE PREHISTORIC SITE IN THE AMERICAN MIDWEST

George R. Milner, Pennsylvania State University

Forty two of 264 well preserved skeletons from an Oneota site in Illinois dated to ca A.D. 1300 exhibit damage inflicted at or shortly after the time of death. This includes injuries from projectile points and other objects (probably celts), cut marks attributable to scalping or decapitation, cut marks from dismemberment of corpses, and canine puncture marks and other forms of damage resulting from gnawing by scavengers. The cultural context, the criteria used in identifying these forms of bone destruction, and the patterning of damage are identified.

TIMING OF INJURY AND MANNER AND CAUSE OF DEATH IN FORENSIC CONTEXT

Norman J. Sauer, Michigan State University
One of the common concerns of forensic anthropology and paleopathology is the timing of injuries with respect to death. A case is presented that illustrates skeletal evidence for chronic, severe, physical abuse; for traumatic injuries that apparently reflect a violent homicide; and for the purposeful dismemberment of human remains associated with disposal. These interpretations were supported by the testimony of several eyewitnesses. Although such documentation is unlikely in a paleopathological setting, the case does demonstrate the value of multiple traumatic skeletal lesions for determining the manner of death.

THE NEW YORK CITY MEDICAL EXAMINER'S MUSEUM

Peggy C. Caldwell, New York City Medical Examiner's Office

The Office of the Chief Medical Examiner, New York City at its current location, on the corner of First Avenue and 30th Street, was officially opened in 1961. Under the direction of then Chief Medical Examiner Dr Milton Helpern, the six-storey building was designed to offer complete autopsy room facilities and related laboratory services for histology, toxicology, and serology. The sixth floor of the building was specifically designated to have a lecture hall, library, and a highly unusual medico-legal museum. A tour of the museum and of the autopsy room floor was part of the 1987 P.P.A. Annual Meeting.

The medico-legal museum contains exhibits dating back as far as 1931, when Dr Helpern began collecting specimens for display, with the idea that they would serve to instruct future generations of doctors, lawyers, and law enforcement agents, mainly in the field of sudden and violent death. The collections have been added to from time to time over the years, and the entire facility has been recently cleaned and recatalogued under the direction of a new curator. Highlights of the displays include an exhibit devoted to non-biological evidence recovered at crime scenes, particularly weapons (icepicks, hatchets, blunt instruments, pillows, knives, etc.), narcotics paraphernalia, and victims' clothing, illustrating a variety of causes of death. There is also a substantial collection of autopsy specimens depicting a variety of objects related to asphyxial death, with these still lodged in the victim's trachea (for example, a spoon, a bottle cap, a flip top, a hot dog, and several examples of food boluses). The vast majority of the collection is devoted to soft tissue specimens from autopsy, revealing a variety of modes of death, from cardiac arrest to trauma and tumors.

The autopsy room facilities are housed in a sub-basement with direct access to the street for case receiving and releasing. The main autopsy room has eight tables, but three other smaller autopsy rooms have two or three tables each for processing special cases (AIDS, decomposed bodies, and police or press sensitive cases). The x-ray room and photography facilities are available on the same floor, along with storage space for some 250 cases, mostly stored in a compartment area in the center of the basement, with two extra refrigerated rooms for shelf storage. Forensic anthropological cases are processed in a small prep room adjacent to the main autopsy room and in the room specifically designated for decomposed bodies.
SECTION 3: ARTHRITIS REVISITED -- EROSIVE ARTHRITIS

Conveners: Howard Duncan and Robert Jurmain

INTRODUCTORY STATEMENT

Howard Duncan, Henry Ford Hospital, Detroit and Robert Jurmain, San Jose State University

This session emphasized several points:
a. The development of a nomenclature encompassing the type of bone defect that is a major feature of erosive arthritis;
b. The recognition that the etiology, pathology, disability caused by and the treatment of erosive arthritis are different from those of osteoarthritis or other proliferative types;
c. When sacroiliac joints are involved at an early age, the arthritis may be erosive at the peripheral joints, and is often associated with simultaneous involvement of the spinal and paraspinal articular surfaces in a manner different from the diffuse bridging scene with osteophytosis;
d. Some primates share similarities with humans in the peripheral and spinal diseases, and these animals specifically may have a genetic predisposition to certain diseases when their serological markers are found more frequently in the diseases group;
e. A major point of significance is the pattern of those joints involved that represent a diseased state more specifically in each individual diseased site.

A dictionary or glossary of acceptable terms is urgently needed for national and international record and communication.

BONE RESPONSE TO INJURY/INFLAMMATION

Howard Duncan, Henry Ford Hospital, Detroit

Bone cell populations normally work together in groups, rather than as individual cells. There is a normal renewal of approximately 4% of cortical and up to 10% trabecular bone each year in the adult human. A focal renewal or repair may be initiated by cell injury or a microcrack, which promotes the initial differentiation of nearby precursor cells to form a group of programmed osteoclasts. These osteoclasts collectively remove dead bone, and are succeeded, after a variable interval of time, by an independent group of osteoblasts, which line the eroded area and replace an equal amount of bone.
to that removed by the osteoclasts, though taking a much longer period of
time (x 4). Injuries, inflammation, and abnormal stimulation interfere with
this sequence (Activation → Resorption → Formation). Variations in
the duration, intensity, and location of the abnormal stimulus can give rise to
different degrees of resorption and/or repair. Osteophytes are thought to
represent an attempt to repair or counterbalance abnormal stress on the bone.

CLINICAL FEATURES OF EROSI VE ARTHRITIS AND SPONDYLOARTHRITIS

James C.C. Leisen, Henry Ford Hospital, Detroit

Chronic, non-infectious, radiographically erosive arthritis may be clinically
divided into several categories, the most common of which are rheumatoid
arthritis and the spondyloarthritides. The latter group can be separated
from rheumatoid arthritis by clinical, epidemiologic, genetic, serologic, and
radiographic criteria. In the last instance, radiographic changes in the
sacroiliac joint have particular importance. The morphologic features of
the rheumatoid erosion in macerated bone of the tibial plateau and metacarpal
head from patients with established rheumatoid arthritis are shown. There
is little information on the morphologic features in dry bone of the sacroiliac
changes associated with spondyloarthritis.

EROSIVE ARTHRITIS IN SKELETAL MATERIAL: RECOGNITION AND
CLASSIFICATION

Juliet Rogers, University of Bristol, England

Today erosive arthritis of all types is an important and relatively common group
of diseases (2 – 3%), which includes rheumatoid arthritis. However, this latter
type of arthropathy is a comparative rarity in the palaeopathological literature.
A survey of a large number of skeletons has been carried out, in which various
joint lesions of an erosive type have been recognised. These changes, together
with any other concurrent lesions, are charted for each joint, and the combination
of bone changes in and around the lesion, the joint, and the distribution of
various lesions on the skeleton suggest a classification of the type of arthritis
in a particular skeleton. Caution is necessary, however, as a particular disease
may vary in severity and presentation in different people, and many joint
diseases are not able to be accurately classified even in a modern clinical
setting.

FIELD STUDIES ON EROSI VE ARTHRITIS IN THE NEW WORLD

Bruce M. Rothschild, St. Elizabeth Hospital, Youngstown, Robert J. Woods,
Kent State University and Kenneth Turner, University of Alabama at Tuscaloosa
Establishing the antiquity of rheumatoid arthritis (RA) requires identification of its bony trademark. That trademark manifests as a symmetrical erosive arthritis, predominantly at the cartilage-bony junction, associated with minimal or no secondary bone reaction. X-ray examination reveals loss of periarticular bony density and bite-like holes at the joint margins. In contrast to other forms of erosive arthritis, sacroiliac and apophyseal (spine) joint fusion does not occur. Although isolated bone erosions can mimic those of RA, the skeletal distribution of RA erosions and the 3 to 1 female predominance of the disorder are unique. Identification of precontact individuals (1,000 – 5,000 years B.P.) in this country, who have classic lesions as described above, in the classic skeletal and sex distribution, support the diagnosis of RA. As these lesions have not been reported prior to 1785 in the Old World, a New World origin for RA is suggested.

EROSIVE ARTHRITIS IN CALIFORNIA INDIANS

Robert Jurmain, San Jose State University

An unusual and perplexing lesion has been observed numerous times in the feet of California Indian populations. This 'pathological change' is seen in the joint between the third cuneiform and the third metatarsal, is usually mostly lytic (erosive) in manifestation, and is found on the plantar aspect -- usually symmetrically on both sides of the joint. In a large collection from the eastern side of San Francisco Bay (Ala-329), the lesion is found in 31 individuals out of a total of approximately 125 individuals with reasonably complete feet (i.e. a frequency of approximately 25%). In addition, the syndrome has been observed in two other site samples from the greater San Francisco Bay area. The condition is usually unilateral (17 cases) as opposed to bilateral (9 cases) for those individuals with both sides preserved. Interestingly, there is a left side predilection: of the unilateral cases, 13 are on the left. In discussion, it was noted that congenital anomalies are expressed phenotypically more often on the left side. Moreover, the same condition was noted as occurring at Libben in Ohio and in a Saxon grave from England: in the latter case, a slide displaying the exact same lesion was shown.

PREPARED GROSS SPECIMENS OF DOCUMENTED EROSION ARTHRITIS AS STANDARDS FOR PALEOPATHOLOGY

Wade Ortel, West Virginia University

Accurate diagnosis of erosive arthritis in paleopathologic dry skeletal materials must depend to some degree on comparison with modern day specimens of known etiology. Bones devoid of soft tissue are virtually never encountered in modern medical practice. A set of extremity bones from a 68 year old patient with established rheumatoid arthritis is presented. The distinguishing features of erosive arthritis include generally rounded, smooth-walled cavities in the fragile cortex of articular surfaces, overlying an excavated, delicate subchondral bone structure in metatarsals and large bones. A collection of skeletal materials
from such patients with documented erosive disease could serve as a standard for comparison with ancient materials.

EROSIVE AND PROLIFERATIVE ARTHRITIS IN NON-HUMAN PRIMATES
C. Jean DeRousseau, New York University

Degenerative joint disease (DJD) occurs in a wide variety of vertebrates, but most observations of animal DJD are anecdotal or describe laboratory or domestic animals: systematic population surveys of animals are rare. In the last several decades, skeletal collections from populations of non-human primates have begun to provide epidemiological data in animal populations that support the hypothesis that the severity and distribution of DJD varies according to biomechanical parameters. Macaques, terrestrial quadrupeds with joints frequently under compression, show more DJD than gibbons, brachiators which frequently hang by their limbs while foraging in the trees. Initial degenerative changes in gorillas are located in zygapophyseal joints rather than in intervertebral symphyses, a distribution that follows biomechanically from their semi-erect posture and locomotion. Within species, variation suggests that free-ranging animals develop vertebral DJD faster than their caged, relatively inactive counterparts. Although osteophytosis is a common aspect of the disease observed in non-human primates, erosive changes are also very common, and occur at most joints. By studying animals of known ages, it is clear that both proliferative and erosive changes are highly correlated with age, that they appear to develop considerably faster in monkeys than in humans, but that their distribution within and between joints is uneven, with biomechanical or local factors affecting their expression. Variations between species may result from species differences in intrinsic mechanisms of joint remodeling and repair, and the expression of remodeling and repair across a given joint probably depends on the biomechanical use of that joint.

SACROILIITIS AND HLA-B27
Bruce M. Rothschild, St. Elizabeth Hospital, Youngstown

Histocompatibility or transplantation antigens were originally recognized as important factors in recognition of self and in processing foreign antigens. Association of specific antigens with specific disease processes has been noted. Especially pertinent has been the recognized association of HLA-B27 in ninety percent of individuals with ankylosing spondylitis, in contrast to 7 - 13% of unaffected Caucasians and 4% of Blacks. General population screening reveals many false positives for every individual actually identified with the disorder, but on an epidemiologic basis, sacroiliitis is more prevalent in those populations (e.g. Pima and Haida Indians) with a high frequency of HLA-B27. It is unclear whether the association is direct, represents linkage disequilibrium, altered immune or receptor function, or cross-reactivity with an exogenous antigen. Ability to identify the antigen in antiquity would therefore be of value. Recent immunologic documentation of treponemal disease in 11,500 years B.P.
skeletal material supports the likelihood that other antigens (e.g. HLA) may be present and recognizable.

SACROILIAC JOINTS IN POSTREPRODUCTIVE WHITE FEMALES

S.S. Dunlap, Reston, Virginia

Sacroiliac joint osteoarthritis was evaluated in 72 females between the ages of 42 and 98, from pelvic remains obtained in a dissecting room population. The iliac side of the joint clearly exhibits the majority of changes, which include irregular, dense bone accumulation, micro- and macroporosity. Eburnation and fusion were not seen on either side of the joint; however, some evidence of the antero-posteriorly oriented billowing was seen in 43 individuals. Osteoarthritic changes were related only loosely to age. Anomalies and lesions in the lumbo-sacral, hip, and pelvic joints, which might be expected to affect sacroiliac joint stability, were not related to the severity of osteoarthritis. Body weight, occupation, and obstetrical histories were available for the majority of the women, but there was no indication that these factors affect osteoarthritis. This sample of joints along with those from males continues to be under study.

OSTEOARTHRITIS AT CHRIST CHURCH, SPITALFIELDS: AN INTERIM REPORT

Tony Waldron, London School of Hygiene and Tropical Medicine, London, England

Christ Church, one of six London churches designed and built by Nicholas Hawksmoor, was constructed between 1710 and 1729. At that time, the hamlet of Spitalfields was undergoing rapid economic expansion, with a great influx of craftsmen and merchants. Starting in the 1970s, as part of a programme of restoration, the crypt was cleared of burials placed there between 1729 and 1867. About 990 discrete inhumations were recovered from the crypt, of which more than a third had coffin plates giving details of name, age, and sex. From the burial registers, it has been possible to trace further details of these individuals, including in some cases their occupation, thus offering great opportunities for anthropological, pathological, sociological, and occupational research. This report covers my findings on the first 415 burials examined. Of these, 39 (9.4%) were infants, 40 (9.6%) juveniles, and 336 were adults. The most frequently observed pathological condition among the adults is osteoarthritis: 125 (37.2%) are affected by the disease. The most common site is the spine, mainly the cervical spine, followed by the shoulders and hands. 88 individuals have osteoarthritis of the spine, 56 have the disease in the shoulders, and 45 in the hands. In many cases more than one joint or group of joints is affected. I have given particular attention to osteoarthritis in the hands and am particularly interested in the extent to which the disease might be related to occupational factors, as Spitalfields was one of the most important centres of the silk weaving industry in England.
SECTION 4: CONTRIBUTED PAPERS
Moderator: Arthur C. Aufderheide

SESSION SUMMARY
Arthur C. Aufderheide, University of Minnesota, Duluth

The torrent of contributed papers offered for presentation this year generated a broadly varied menu with enough delectable tidbits to satiate every taste. Investigators reviewing the large skeletal collections from Nevada and various European sites had distilled from them such fascinating vignettes as decapitations, short arms, and evidence of therapeutic efforts (splinted fractures, etc.). Two authors presented skeletons from South American sites revealing treponemoid changes; one of these, from Bogotá, Colombia, demonstrated advanced characteristic lesions in both skull and long bones, and was radiocarbon dated at 4030 ± 80 years B.P.! A review of fractures identified in the remains of a feral mountain gorilla group provided a rare glimpse into the hazards of an arboreal life style. The metabolic diseases were represented by the pathophysiology of rickets and demonstrations of its skeletal impact. The often paradoxical correlations and conflicting views of dental hypoplastic changes were again evident in the minisymposium of three papers on this topic: in his review of these, Dr Corruccini felt that sharper definition of the varied morphological presentations will need to precede (and lead to?) a clearer understanding of the nature of each. Individual case presentations involving ectopic shoulder joints, midline facial destructive lesions, treponemoid alterations, possible scalping incisions, and others served to remind us of the challenge of differential diagnosis in which we are constantly engaged, as well as the relationship between structure and function.

TWO SHORT ARM PROBLEMS
D.A. Birkett, Cleveland County Archaeology Department, Middlesbrough, England

Two cases of skeletons that show a shortening of one arm are described. One is an adult female from a mediaeval (14th - 15th C.) cemetery, showing shortening and poor development of all the bones in the right shoulder girdle and arm. It is thought that childhood poliomyelitis (infantile paralysis) is the likeliest diagnosis. The other is a child from 3rd or 4th C. Roman Britain, in whom there is a very short angulated humerus with a depression in the posterior part of the upper metaphysis and a deformity of the upper epiphysis. The
forearm bones were normal. Trauma such as a fracture involving the upper part of the humerus including the epiphysis might have produced such a deformity with cessation of growth of the humerus.

OSTEOLOGICAL EVIDENCE FOR DECAPITATIONS IN TWO BRITISH ROMAN CEMETERIES

Helen Bush, University of Sheffield and Ann Stirland, Woodend, Nr. Towcester, England

Fifty-six first to fourth century cemeteries in Britain show evidence for decapitation. Of these, twenty-six appear to be late Roman, i.e. late third to fourth century. Evidence from two of the late Roman cemeteries is presented. Cirencester, in S.W. England, was a regional capital in the fourth century. Four hundred and twenty-one individuals from the city cemetery have been examined. At least nine decapitated individuals have been identified. Ashton Roman town was situated to the northeast of Cirencester. The burials total two hundred and ninety-seven, of which six were decapitated. A detailed osteological examination has given evidence for the employment of different methods of decapitation. Because decapitation was not a common method of capital punishment in the Roman Empire, alternative explanations are offered for the ritual.

TRAUMA AND TREATMENT IN THE BRITISH HISTORIC PERIOD: A CASE STUDY ON HUMERAL FRACTURES

Charlotte A. Roberts, University of Bradford, England

This brief paper outlines a small area of this research program, to indicate the depth to which fracture studies should be moving. Detailed anatomical knowledge is essential in understanding the effects of fractures at different levels of the humerus. A small group of humeral fractures isolated in the research is considered. Healing, and treatment available in the British Historic period for these fractures, are also discussed.

RICKETS

Patty Stuart-Macadam, London, England

Rickets is a disease of infancy and childhood, characterized by the failure of mineralization of cartilage and bone. It is produced mainly by insufficient vitamin D, either because of dietary inadequacy or because of a lack of short ultraviolet rays of the sun. A survey of historical, clinical, and archaeological information indicates that, contrary to popular opinion, lack of sunlight is by far the most important factor in the development of rickets. This has
implications for the interpretation of cases of rickets found in skeletal material from the past.

DISLOCATION AND/OR CONGENITAL MALFORMATION OF THE SHOULDER JOINT

Pia Bennike, University of Copenhagen, Denmark

The subject matter presented is a medieval skeleton, of an approximately 16 year old boy, excavated from a Danish cemetery. It reveals several pathologic changes, probably due to congenital malformation, of which the most intriguing is seen at both scapulae, with the changes being bilaterally symmetric. As far as we know, no similar case has been described in clinical observation or in skeletal finds. (Short presentation of a paper given in full at the Sixth European Meeting, Madrid, September 1986: see Meeting Report, December 1986 for full abstract).

DENTAL HYPOPLASIAS IN THE FRENCH PALEOLITHIC

Mary Ursula Brennan, New York University

The European Paleolithic is characterized by both biological and cultural change, but relatively little is known about the relationship between these two areas, and studies dealing with the subject have dealt with it on a global rather than a regional or population level. This study offers new data on this dynamic relationship from approximately 100,000 to 10,000 B.P. in France. Frequencies of biological stress indicators, such as hypoplasias, were determined for over 300 hominids from the Acheulean, Mousterian, Aurignacian, Upper Perigordian, Solutrean, and Magdalenian periods of southwestern France. Preliminary results suggest that hypoplasias, almost non-existent in the Lower Paleolithic, increase dramatically across the transition to the Middle Paleolithic, and again across the transition to the Upper Paleolithic. Each of the four Upper Paleolithic periods shows different frequencies of hypoplasias. Transitions from Lower to Middle, and Middle to Upper Paleolithic appear to have been accompanied by an increase in biological stress. In the cultural periods that follow the Middle to Upper transition, stresses appear to show considerable variation, depending on cultural affiliation.

DENTAL MICRODEFECTS IN A COLONIAL MAYA POPULATION

Marie Elaine Danforth, Indiana University

The skeletal series from the colonial Maya site of Tipu, Belize was investigated for evidence of introduced infectious diseases, using dental microdefects.
Dating to the late sixteenth century, Tipu had sufficient European contact for its inhabitants to have been exposed to epidemic disease. Frequency of striae of Retzius, linear enamel hypoplasia, and Harris lines were scored in 67, in order to evaluate childhood health patterns. Had severe stress episodes been present, they would have been expected to be simultaneously recorded by all three indicators. However, the indicators showed no significant correlations. Juvenile growth patterns and the absence of bone lesions in adults further supports the healthy status of the Tipu population.

ENAMEL HYPOPLASIA -- A POOR INDICATOR OF NUTRITIONAL STRESS

E.J. Neiburger, Andent Foundation

Enamel hypoplasias (the malformation of tooth enamel) in prehistoric populations are often used as a prime indicator of nutritional stress, and considered prime evidence of the quality of a population's diet, lifestyle, and social-political status. They should be used, however, only in conjunction with more reliable indicators (e.g., Harris lines, anemia bone lesions, etc.). Although enamel hypoplasias can be caused by dietary deficiency, there are many other causes indistinguishable from lesions created by nutritional stress. These include genetics (hereditary hypoplasia), poor maternal care, failure to absorb syndromes (Vitamin D deficiency), hormonal imbalances (hypoparathyroidism), toxin ingestion (fluoride, oxalic acid), tooth trauma, high fevers, hypocalcification-caries, selective tooth loss, local customs (early weaning, child labor), and individual physiologic responses. In living populations, all these factors can influence the incidence of enamel hypoplasia with or without nutritional-dietary stress, and modern dentistry cannot accurately predict the development in clinical patients. Extrapolations as to nutritional or social stress based on the incidence of enamel hypoplasias occurring in extinct populations should, by themselves, be discouraged.

SKELETAL PATHOLOGY OF THE MOUNTAIN GORILLA

Nancy C. Lovell, Cornell University

During her field research in Rwanda, Dian Fossey buried deceased animals at her camp. In the late 1970s, thirty skeletons were disinterred and shipped to the Smithsonian Institution. I examined these in 1986, and this paper presents the pathological findings. Twenty-six per cent of the observable skeletons exhibit at least one traumatic lesion. One third of these occur in the hands and feet. Injured males outnumber females by two to one. Inflammatory lesions are found in 29% of the sample, and appear to be secondary to trauma in most cases. Degenerative changes affect 43% of the skeletons, and are located principally in the lumbar spine. No caries were observed, but abscesses affect 41% of the cranial sample. These are usually associated with extensive calculus deposits, and are located interproximally. These findings are discussed in relation to behavioral data and autopsy results for some of the animals.
SKELETAL PALEOPATHOLOGY OF A SLAVE BURIAL POPULATION FROM SURINAME

M. R. Khudabux, Anton de Kom University, Suriname

Paleopathological analysis of the skeletal remains of slaves of African ancestry from a burial place on the cotton plantation of Waterloo, Suriname, dating from 1793/1796 to 1861 A.D., elucidates their diseases and strengthens historical records. A high incidence of an infectious disease with multiple bone lesions (viz., treponematosis) may be the result of a surplus of men on plantations. Several individuals demonstrated skull lesions (spongy hyperostosis) due to severe anemia. The low incidence of rickets was probably due to climatic conditions. Most probably, the diseases played an important part in preventing the natural increase of these populations.

PALEOPATHOLOGY IN PRECERAMIC BONES FROM COLOMBIA: EXAMPLES OF SYPHILITIC LESIONS FROM THE SITE OF AGUAZUQUE, SOACHA

Gonzalo Correal Urrego, National University, Bogotá, Colombia

A preceramic site (Aguazuque) from the savannah of central Colombia's highland plain at 2640 meters yielded the skeletal remains of 40 individuals. Thirteen of these demonstrated changes expected in treponemal infections in the long bones, most marked in the tibia, resulting in 'saber shin' deformity in some. In addition, three of these also revealed skull involvement, including caries sicca, reactive hyperostosis, and diploic obliteration. One of the skeletons with both skull and long bone lesions is radiocarbon dated at 4030 ± 80 years B.P. Although some of these lesions could be those of yaws, the rarity of yaws in this part of modern Colombia, and the characteristic morphology as well as its advanced degree in the cranium, strongly suggest that syphilis, caused by Treponema pallidum, is the most probable diagnosis.

THE PALAEOPATHOLOGY OF AN ARCHAEOLOGICALLY RECOVERED SKELETAL SERIES FROM THE STILLWATER RESERVOIR AREA, NEVADA

Michele B. Haldeman, Sheilagh Brooks and Richard H. Brooks, University of Nevada

In 1985, as the Stillwater Reservoir waters receded, numerous human bones were exposed, and an archaeological salvage operation was initiated within a four mile square area of the Reservoir. To date, over 1,000 skeletal elements have been recovered and approximately 133 individuals identified from the commingled remains. In general, this skeletal series shows pathology in crania, dentition and long bones comparable to that seen in other archaeologically recovered human remains from sites in this region of Nevada. Eburnation occurs in 5 males and 2 females, 7 out of the 133 skeletons, or 5% of the series.
Males showed eburnation in the temporo-mandibular, axis/atlas, elbow, fingers, knee and ankle joints, and females were affected in the elbow, knee, and ankle. This is the highest frequency of eburnation so far observed in a skeletal series from the Nevada Great Basin.

TREPONEMATOSIS: A POSSIBLE CASE FROM THE LATE WOODLAND OF NORTH CAROLINA

Kathleen J. Reichs, University of North Carolina at Charlotte

The skeleton of an adult female exhibiting evidence of treponemal infection was recently recovered from the Hardin Site in the Piedmont region of North Carolina. Archaeological indicators suggest a Late Woodland affiliation. The skeleton is affected by a diffuse process resulting in surface changes, both destructive and appositional, node formation and shaft expansion, medullary encroachment and filling, cortical thickening, and pathological fracture. There is both cranial and postcranial involvement. Although treponemal infection is indicated, the atypical nature of the total pattern raises the possibility of multiple pathological processes operating simultaneously. The significance of this case is threefold. It provides information on the ability of prehistoric peoples to cope with disease. It reminds the paleopathologist of the danger in attempts at singular and specific diagnoses. It sheds new light on the epidemiology of the treponemal diseases.

MIDLINE DESTRUCTIVE LESIONS OF THE FACE AND THEIR DIFFERENTIAL DIAGNOSIS

James Tenney, Lowie Museum of Anthropology, Berkeley

The finding of an individual with a destructive lesion involving the center of the face creates a spectrum of diagnostic possibilities. The process of listing them, eliminating certain elements, and substantiating to a greater or lesser degree the remaining ones is the time-honored method of arriving at a conclusion. Even with the rather limiting constraints in paleopathology, based on morphology and osseous distribution alone some diseases suggest themselves, although others seem to be more remote. Study of a given population with respect to numbers and general health as a whole can sometimes shed light, along with considerations of environment (climate), heredity, and social practices. A final look in terms of the prevalence of a given disease may allow a 'best-guess' as to diagnosis. Lesions in the nasopalatine area as elsewhere lend themselves to a basic categorization as congenital, traumatic, infectious, neoplastic, and idiopathic, as well as the ever present miscellaneous group. Certain lesions, however, have a predilection for the center of the face. This is particularly true of some infectious diseases such as tuberculosis, leprosy, and syphilis.
POSSIBLE EVIDENCE OF SCALPING IN A PLAINS LATE ARCHAIC/EARLY WOODLAND MORTUARY

John A. Williams, University of North Dakota

The Bahm Site (32M097) is a cairn burial located in south central North Dakota. Sixteen individuals were interred in this mortuary. An uncorrected radio-carbon date of A.D. 30±140 was obtained for the site. One unusual feature found is the elaborate nature of cut marks on the skulls and several long bones. A 9/10 year old child displayed an unusual lesion of the crown of the skull. This forms a roughly circular band that follows the contour of the crown of the skull. The lesion varies in depth from 1 to 2 mm and in diameter from 4 to 8 mm. In several locations, the lesion has perforated through to the endocranial surface. Several small circular lesions are present near the perimeter of the primary lesion. No sclerous or granulation tissue is evident. No other pathologic states were evident on either the skull or the in situ dentition. No infra-cranial remains were recovered. The location and nature of the lesion suggest that it is the result of trauma such as scalping. In that case, it would be atypical, in that no granulation tissue is present on the crown. This would imply that an incision was made while the individual was still alive without removing the scalp.

STEREOSCAN IMAGING FROM COMPOSITE 'CAT' SCANS

Peter K. Lewin, Hospital for Sick Children, Toronto, Ontario, Canada

Following a CT scan of the brain of a 3,000 year old Egyptian mummy (1976), and a total body scan of a 9th century B.C. mummy (1978), a three dimensional imaging computer program has been developed, and three dimensional images have been constructed from sequential data obtained by the two dimensional CT scan. Preliminary three dimensional see-through images of an ancient Egyptian mummified cat and a Greco-Roman head are presented. This technique can also be applied to other imaging methods and enhanced with newer digital processors. These new non-destructive imaging methods will be invaluable in the three dimensional examination of mummified remains and their internal structures, also for archaeological objects, thus keeping these valuable specimens intact for posterity.
SECTION 5: EXHIBITS

RHEUMATOID ARTHRITIS IN A DANISH SKELETON 2,000 YEARS OLD?

Pia Bennike and J.P. Gylding-Sabroe, University of Copenhagen, Denmark

During the years 1876 - 1880, twenty-seven graves from the Late Roman Iron Age (0-400 A.D.) were investigated at Varpelev, a small site on Sjaelland, Denmark. The human remains of twelve individuals from this cemetery were studied for the first time, as part of a paleopathology study that included remains from 2,000 prehistoric Danish skeletons. One skeleton, probably a male about forty years old, showed pathology changes of the handbones similar to changes often seen in rheumatic arthritis. The most characteristic changes leading to a diagnosis of rheumatoid arthritis are the cystic erosions of the caput of the second metacarpal bone. The erosions are found to be bilateral, but are missing in other metacarpal bones. Other changes in the joints are periarticular cystic lesions, pittings, and new bone formation, which are also known in osteoarthritis, and may probably be caused by this degenerative disease. Some authors have argued that rheumatoid arthritis is a relatively new disease, basing the statement primarily on the lack of evidence of the disease in skeletal remains, writings, or paintings prior to the 17th century. Bones from hands and feet are scarce in skeletons from excavations. In modern paleopathology studies, the skeletons are studied systematically, and this has resulted in several finds that may be diagnosed as rheumatoid arthritis.

AN EXTREME CASE OF HYDROCEPHALY?

Rosanne M. Meer, Indiana University and Beloit College

Few cases of hydrocephaly have been described in the paleopathologic literature. A juvenile calvarium recovered from an unprovenienced location in Washington, and misidentified as a turtle skeleton, is an apparent example of extreme hydrocephaly. This specimen, from the Logan Museum, Beloit College is broken and portions missing, including the face. The fragmentary state of the specimen is probably responsible for its misidentification. Measurements of the brain case illustrate the unusual configurations of this specimen: maximum length 21.1 cm, maximum width 21.8 cm, maximum height (approximate) 22.4 cm, circumference (approximate) 71.1 cm. Comparison with turtle skeletons and other faunal specimens support classification of this specimen as human. Comparison with published clinical cases and one skeletal example support a diagnosis of hydrocephaly, and suggest possible complications from acrocephaly.
OSTEOPATHOLOGY AT THE ARMED FORCES MEDICAL MUSEUM

Paul S. Sledzik, Sean P. Murphy and Joan M. Macdonell, Armed Forces Medical Museum

The Armed Forces Medical Museum in Washington, D.C. houses one of the world's largest pathology collections. Included in this collection is an assemblage of over 3,000 dry bone specimens, exhibiting a broad spectrum of osteopathology. These specimens are primarily from known individuals of the 19th and early 20th centuries, with a majority from the U.S. Civil War. Each specimen has a variety of records associated with it (e.g. surgeon's reports, field notes, x-rays, etc.). The association of documented pathologic specimens together with medical records makes the collection a useful tool for establishing diagnostic criteria for application to paleopathology. This poster presents a brief history of the museum and of its role in the founding of American paleopathology, as well as the range of osteopathy in the museum's collection.

SEX DETERMINATION USING THE OS PUBIS

Leslie Sutherland and Judy Myers Suchey, California State University

The presentation stresses the use of the ventral arc in sex determination of the os pubis. In a sample of 1284 well documented pubic bones, 96% were accurately sexed using this trait alone. Young adolescent females lack the arc, but they can be accurately sexed by the shape of the os pubis. Males often show a distinct line on the ventral aspect of the os pubis, but it parallels the border, and will rarely be confused with the arc seen in the female. Also included in the exhibit is a series of 8 pubic bone casts for sex determination. These models are available for researchers to increase the reliability of pubic sexing, and are sold at the lowest price possible. For further information, please write to J.M. Suchey at California State University, Fulleton, CA 92634.

Two other exhibits were also presented as papers, and the abstracts can be found in Section 4. These are:

MIDLINE DESTRUCTIVE LESIONS OF THE FACE (J.M. Tenney) and
POSSIBLE EVIDENCE OF SCALPING (J.A. Williams)
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