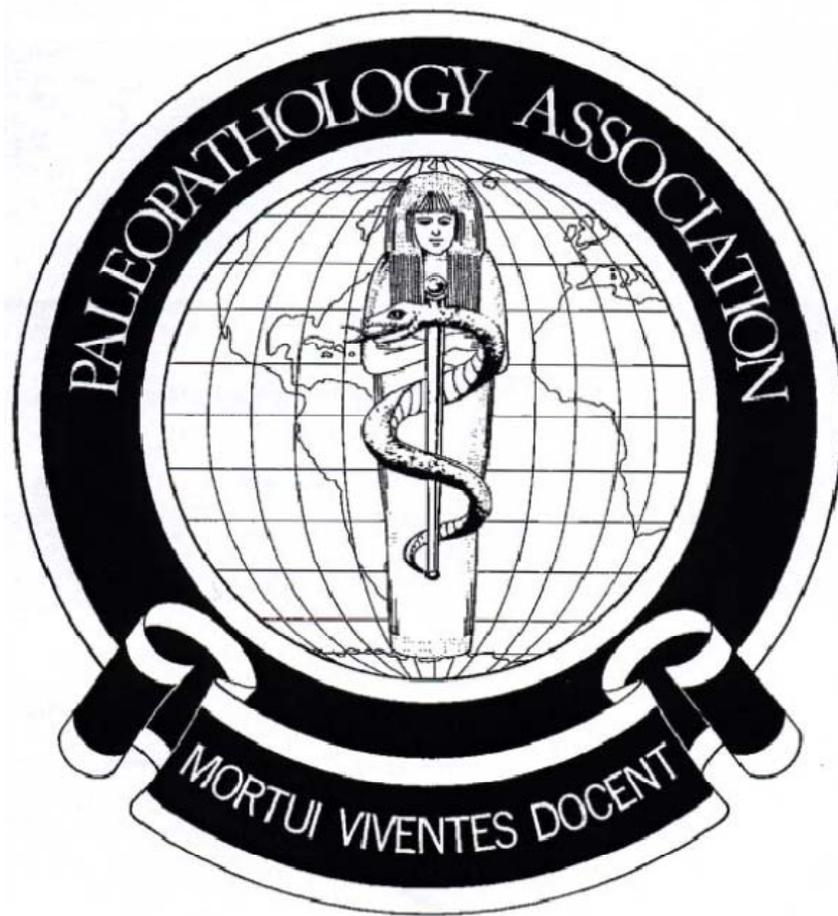


Supplement to the Paleopathology Association Newsletter



Paleopathology Association

Scientific Program and Abstracts

**Meeting in South America IV
Lima, Peru**

November 2-5, 2011

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I would like to extend my profound gratitude to Dr. Guido Lombardi for volunteering his time to translate the many Spanish language abstracts into English. Dr. Lombardi was responsible for translating more than a third of the abstracts into English. Without his help this publication would not have been completed.

Andrea Buck, Editor

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Eve Cockburn Student Prizes

There were two prizes awarded in the Student Competition, one for a podium presentation and one for a poster presentation.

Eve Cockburn Student Prize Competition = ***

Winner of Eve Cockburn Student Prize = *Winner**

Podium Presentation Abstracts

Symposium 1

Skeletal Trauma Interpretation: Discovering Patterns in Interpersonal Trauma

Coordinators

Mag. Mellisa Lund– Equipo Peruano de Antropología Forense

Dr. John Verano – University of Tulane

Perimortem Injuries in Wari Funerary Contexts from Huaca Pucllana: between the Ritual and the Interpersonal Violence

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The analysis of 119 skeletons excavated from 60 tombs of the Middle Horizon–Wari in Huaca Pucllana (Lima) between 2005 and 2010, allowed observation of some of the most frequent perimortem injuries on those remains. The analysis included the sex and age determination as well as the observation of the type and amount of perimortem lesions by every corporal segment affected. This information was contrasted with the field information which permitted us to distinguish the relation between multiple / individual burials and the type of injuries found on each body.

Even though most of the bodies did not show any evidence of perimortem injury or these were not observable, and when they were present, there was a prevalence of blunt force trauma to the head or sharp trauma to the rest of the body, while in a few bodies, both kinds of lesions were evident.

Together, blunt trauma and sharp injuries may be related in a few cases to ritual violence, possibly the sacrifice of children who were buried as part of the fill of the tombs, while in other cases the injuries were related to some form of interpersonal violence.

It was possible to deduce a relationship between multiple burials and sacrificed individuals and individual or double burials to interpersonal violence; however it is important to consider that not all the perimortem injuries are necessarily an indicator for sacrifice or interpersonal violence. Only the analysis of the contextual information including the one coming from the burial, the skeleton, such as age, sex as well as the type, frequency and distribution of the perimortem lesions that may be present throughout the body, can make it possible to see the difference between the these two phenomena.

New evidence of Moche specific treatments, Uhle Platform, Huaca de la Luna

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The Moche lived in northern desert coast of Peru during the Early Intermediate (AD 200-800). Their largest site, Huaca de la Luna, is located in the Moche valley, 10 km SE of Trujillo. The Uhle platform, in the west fa ade of the Huaca, was excavated between 1999 and 2010, upon an agreement between the Moche Intl. Program led by C. Chauchat (Maison Ren e Ginouves, CNRS) and the Huaca de la Luna Project led by S. Uceda and R. Morales (Natl. University of Trujillo). This paper focuses on a defined context at the east end of the platform. Besides architectural feats, the study unearthed 57 graves, some incomplete human skeletons, and many scattered holding cutmarks. 13 individuals were characterized by their hands and/or

feet. These findings resemble previously excavated contexts as well as iconographic narrative scenes, such as the “cliff-plunging” sacrifice. Different possible scenarios are considered in order to understand the meaning of sacrificial practices at the Uhle platform.

Victims of Human Sacrifice in the Chotuna-Chornancap archeological complex: A Multidimensional Reconstruction of Ritual Violence in Late Prehispanic times, Lambayeque Valley

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Upon the demise of the Moche in northern Peru, representations of human sacrifice largely disappeared in narrative art, but rituals offering human lives persisted. This paper integrates data from funerary contexts, skeletal trauma, health status, life history, and genetic structure to develop a socio-bioarchaeological reconstruction of sacrifice in the Chotuna-Chornancap archeological complex in the Lambayeque Valley. More than 50 sacrifice victims have been documented in two sectors that make up this site. During the Chimú occupation, death ritual tended to involve a wide range of victims (children, women, and elderly men) and methods (throat-slitting, chest-cutting, semi and full decapitation). Under Inka rule, sacrifices focused on throat-slitting and chest-cutting, and on children and young women. Nevertheless, regional and diachronic analyses of archaeological contexts indicate continuity of sacrifice rituals in the area since Sicán or Lambayeque and Moche times. Therefore, this suggests that there was little Chimú or Inka intervention in local ritual practices. Victims’ health, nutrition, isotopic variation, and inherited dental traits suggest that they were drawn from the local population of ethnic Muchik substrate, descendants of the earlier Moche. Also, with caution, it is possible to consider that some symbolic sacrificial elements in this site represent forms of generative violence rather than a destructive one. Methodologically, this paper highlights the use of a multidisciplinary approach to reconstruct ancient ritual sacrifice and local social identity in the later periods of Lambayeque’s prehistory.

Death, Trauma, and Their Relationship with the Possible Causative Weapons in the Early Colonial Period in the Cemetery Puruchuco – Huaquerones: a Multidisciplinary Approach

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A few years ago, one of the most important archaeological and historical discoveries from the early colonial period, particularly related to the Spanish conquest of our territory, was discovered in one of the cemeteries located in the archaeological site of Puruchuco – Huaquerones. A group of individuals buried in completely different ways than the classic Inca burials was recovered. According to the context, characteristics, and location of the discovery, the members of the project that excavated them relate these individuals to one of the most important events of the Spanish Conquest, the rebellion of Manco Inca. This rebellion of 1536 was lead by Quiso Yupanqui, leader of the Puruchuco-Huaquerones, in an attempt to reclaim Lima from the Spaniards, who were assisted by some of the local native alliances. With the help of forensic anthropology methodology in the analysis of trauma, we intend to add to

ethnohistorical information referred to in historical documents about alliances between Spaniards and local communities. We identify patterns of trauma and attempt to correlate these patterns with the causative weapons.

Patterns of Perimortem Cranial Trauma from a Mass Killing, from the Final Occupation of Kuelap, Chachapoyas, Peru

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Recent discoveries from Kuelap, the monumental Chachapoyan site in the montane region of northern Peru, have revealed evidence of a large scale killing event that occurred during the terminal occupation of the site. While the archaeological context is not consistent with a mass grave, or a collective burial typical of this region, the osteological analysis of the skeletal remains clearly indicates mass violence. This study presents the type, location and distribution of perimortem blunt force trauma observed in the cranial remains of 106 individuals, including adult males and children of various ages. It is notable that there were only 5 women recovered in this sample. Almost all the crania were highly fragmented and reconstructions were challenged by the extensive perimortem fractures but also because of taphonomic damage. There was no difference in the frequency of injuries between adults and subadults, but there were a higher proportion of blows to the anterior portion and faces of the adults. This paper discusses the methodology for observing these types of fractures, and a comparison between the distribution of antemortem fractures and these perimortem injuries demonstrates a significant difference. With these patterns we can discuss the difference between fatal and non-fatal, and interpretations of the level and type of violence experienced in the ancient Andes.

Trauma in Formative Populations from South of Lima ***

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Four small samples of human skeletal remains from the Formative period of the Peruvian Central Coast (circa 1800-200 B.C.) were analyzed in order to estimate the prevalence of fractures among these populations. The four sites (Asia, Asia Baja, León Dormido 3, and León Dormido 17) are seashore settlements located in the district of Asia (Province of Cañete, Department of Lima), spread through an area of 20 Km approximately. The samples consist of 18 individuals from Asia, 14 from Asia Baja, 7 from León Dormido 3, and 8 from León Dormido 17. A “most probable cause” was assigned to each fracture (or group of fractures), following the next categories: a) Malintend fractures b) Accidental trauma c) Occupational (“stress” fractures) d) Unknown cause. Although none of the samples were large enough for formulating conclusive statements by themselves, the similarities of the sites regarding time and space allows joining them in a single unit of analysis. The combined data from the four Formative samples from the district of Asia presented in this work showed a high prevalence of fractures among these populations (about 65% both in males and females), accidents (especially falls) being the most probable cause of them. There seem to be no differences between sexes, meaning that probably all the adult population was exposed to similar hazards (possibly due to the rugged topography of the area). The absence of any evidence of malintend trauma suggests that these populations did not face inter nor intra group violence.

Hostile encounters: Skeletal trauma in pre-ceramic populations from the Sabana de Bogotá, Colombia

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The early people that inhabited Sabana de Bogotá were hunter-gatherers. During the pre-ceramic period (10,000-2,000 A.P.), these hunter-gatherers adjusted their subsistence strategies and settlement patterns, likely in response to intense environmental changes in the area. The Aguazuque site is one example, in which the late period (5,000-3,000 A.P.) occupation demonstrates the adoption of horticultural practices in response to environmental changes. This adaptation of subsistence strategies in turn influenced other aspects of the population dynamics. Increased sedentary living and demographic growth increased infectious disease prevalence like treponematosi. An additional response to increased population size and decreased mobility may be a change in the prevalence of interpersonal violence. To date, the analysis of traumatic injuries in Colombia pre-Hispanic populations has not been systematic, especially in early groups. The purpose of this study is to evaluate the skeletal traumatic lesions in order to identify their distribution by sex and anatomical location, and establish whether these lesions correspond with accidental or interpersonal violence injuries. Seventy two adult skeletons were examined from the early and late pre-ceramic periods of the Tequendama, Checua and Aguazuque sites. The fractures in limbs, skull and face were recorded including an evaluation of their consolidation process. From our analysis, we found that upper limb lesions were commonly associated with accidental causes. Additionally, most cases of interpersonal violence were present only in male skeletons from the late period, suggesting a temporal increase in the violent encounters between the peoples that occupy this region.

Identifying manipulation evidence to interpret cannibalism: Analysis of human and animal bones from Malalmuerzo cave archeological site in Granada, Spain

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The finding of broken human bones with cutmarks and thermal changes, associated with animal bones with the same characteristics in many archeological sites, has prompted the interpretation of numerous behaviors among which cannibalism is highlighted. Excavations at Malalmuerzo cave in Granada, Spain, has retrieved a large number of materials, including two bone samples whose characteristics were the subject of studies to identify traces of intentional manipulation. 750 human and 596 faunal specimens were analyzed in order to register macroscopic criteria to establish the signals produced by various bone-modifying agents. Therefore, the cave's osteological assemblage was contrasted with the database. Cannibalism was hypothesized to show human remains receiving identical processing as carcasses consumed. A pattern for carnage was therefore developed for the treatment of faunal remains in the cave. Two alternative hypotheses were critically discussed: secondary burial practices and violence – war. Two criteria were especially looked for: human bites and evidence of bone cooking. The study showed that 74.4% of human and 75.2% of the animal bones showed signs of manipulation, suggesting perimortem identical treatment. The bones of thirty individuals of both sexes and of almost all ages were subjected to the same treatment of cooking and consumption

similar to the treatment of several animal species in the region. Thus, Malalmuerzo cave shows evidence of cannibalistic practices over the Neolithic period.

Trepanning in the Pre-Columbian Andes, a case-study from Keushu (Ancash, Peru)

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Craniotomies are a vivid example of the surgical skills of ancient Andean populations. Recent and past studies have revealed that multiple individuals were subjected to, and survived, more than one trepanation, that both sexes and all ages could be trepanned, and that some interventions were to treat head trauma. This first case-study from the northern highlands offers insights into trepanation practices during a precise period of time at one single location. The sample comes from two collective mortuary structures from the site of Keushu (Ancash, Peru), dating to the Middle Horizon (MH) and Late Intermediate Period (LIP; AD 600- 1470). This study sought to identify trepanation techniques, preferred trepanning loci, survival rates and possible motives. From a minimum number of 66 individuals, seven adult neurocrania presented trepanations. Three techniques were employed: scraping, linear cutting, and boring and cutting. Scraping was the most common. Long-term healing was evident in 12 of the 16 trepanations identified. Two of the intervened crania showed clear evidence of trauma associated with the procedure. This analysis confirms observations made in other recent studies of trepanation in the pre-Columbian Andes as to over-all survival rates, preferred trepanning loci, and patient profile. Moreover, in line with previous research, this study also suggests that at least some pre-Columbian craniotomies, if not all, were practiced as a form of medical treatment. Finally, it provides evidence for trepanation practices in the northern Central Highlands of Peru during the MH and LIP.

Skull Fracture and Trepanation at Marcajirca, Callejón de Conchucos. Ancash, Peru

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Studies of large collections of trepanned skulls from the central and southern highlands of Peru have demonstrated that trepanation was a common method of treating skull fractures in some prehispanic Andean cultures. Similar data have emerged more recently from the Chachapoyas region of northern Peru. An important geographic region lying between Chachapoyas and the central highlands, is the Callejón de Conchucos and this is evident because the Royal Inka road passes through the area. While this region has been the focus of extensive archaeological investigation, there has been only limited bioarchaeological research until recently. In this paper we present preliminary results of bioarchaeological investigations now being conducted at the site of Marcajirca, a large mortuary complex located at 3800 meters on the eastern side of the Cordillera Blanca. Numerous chullpas (funerary structures) and burial caves dating from the Late Intermediate Period through the Early Colonial Period (c. AD 1000-1600) are found throughout the site. A large sample of human skeletal material has been recovered, and is currently being analyzed from various perspectives. In this paper we present the preliminary results of a study of skull fracture and trepanation at Marcajirca, based on the analysis of seventeen crania with fractures and seven crania with trepanations. We

present data on fracture frequency, location and healing, and examples of trepanations associated with skull fracture.

Skeletal Trauma at Rinconada Alta, Peru

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The examination of health and disease in skeletal remains can provide important information on the lifeways of individuals and groups. Specifically, skeletal trauma can provide insight into the interaction of the population with its physical and sociocultural environments including physical activities and hazards as well as the presence of violence. Rinconada Alta, located on the outskirts of Lima, Peru, dates to the Inca Period (1470-1532) but the burials suggest that the population was primarily lower class, non-Inca craftspeople. An examination of trauma on the skeletal collection from Rinconada Alta provides useful information on the daily life of a working population from the Central Peruvian coast from this period.

The skeletal trauma observed at Rinconada Alta included dislocations, fractures, cranial trauma and vertebral trauma; 51.6% of the sample had evidence of at least one of these traumas. The males at Rinconada Alta had a higher incidence of all types of trauma except for dislocations and vertebral compression fractures. The observed trauma, particularly healed trauma, was associated with increased age; adolescents had a high frequency of perimortem trauma. Antemortem fractures to the ribs and Schmorl's nodes on the vertebral bodies were the most commonly observed traumas. Both antemortem and perimortem cranial trauma were present. Most of the observed traumatic injuries were caused by accidental events such as falls although some violence was present; this violence likely included interpersonal fights and warfare.

Putting flesh on bones: using evidence for healthcare provision in prehistory to explore questions of social relations and individual identity

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In recent years increasing attention has been given to what skeletal indicators of trauma may reveal about past societies, but the predominant focus has been on interpreting injury acquired either through interpersonal violence or through occupational activity. In some instances it may be possible - and possibly more rewarding - to shift this focus from the source of injury and its manner of acquisition to the domain of human intervention and longer term involvement in response to trauma impact. Where there is osteological evidence that an individual survived significant and disabling trauma for a substantial amount of time, it can safely be inferred that this person received care during this period. Using a newly developed, contextualised, 'bioarchaeology of care' analysis to identify what this care likely comprised, and who may have provided it, offers a unique window into contemporary behaviour and practice. In turn, this allows a more nuanced approach to questions of group identity, and may also permit speculation about characteristics of participants in the caregiving relationship. Man Bac Burial 9 (M9), a young male from Neolithic Vietnam born with Klippel-Feil Syndrome, lived for around a decade with a quadriplegia most probably triggered by a minor traumatic incident in adolescence. M9's pathology is described in Oxenham, Tilley et al (2009), and the extent of his disabilities, care requirements and probable nature of care received are analysed in Tilley and Oxenham (2011). This current presentation goes further than was possible in these articles, using the case of M9 to illustrate how applying the bioarchaeology of care methodology to

evidence of healthcare responses to trauma and disease provides insights into complex issues of social relations and even into aspects of individual identity.

References

Oxenham MF, Tilley L et al. 2009. Paralysis and severe disability requiring intensive care in Neolithic Asia. *Anthropological Science* 117:107-112.

Tilley L and Oxenham MF. 2011. Survival against the odds: modeling the social implications of care provision to seriously disabled individuals. *International Journal of Paleopathology* 1:35-42.

Interpretation of bone injuries –with examples from a pathological bone sample and skeletons of numerous inhumation graves, a mass grave and bog find from Danish prehistory covering 7,000 years

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There are many ways to study the pattern of human aggression, violence and war of the past. Certain types of burials may indicate that some violent actions may have taken place, such as the presence of mass-graves, or separate lying graves outside a cemetery. Together with archaeological aspects such as artifacts and burials, the study of human remains is important in our understanding of aggression, accidents and possible treatment of the past, but the interpretation of traces on bones are, however, rather crucial for the final conclusions. A study of prehistoric Danish skulls shows, when compared with pathological bone collections and known cases, that possible differential causes to traces of traumatic injuries such as accidental injuries, postmortem damage and diseases should not be ignored. It clearly helps to illustrate the problems surrounding reliable patterns of aggression in relation to various preservation conditions.

Symposium 2

Radiography and Endoscopy in Paleopathology

Coordinator

Joe Salazar

Field Paleoimaging in Perú: Past, Present, and Future

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This presentation will describe the paleoimaging efforts made in Perú with the intent of looking ahead to the next generation of field paleoimaging. The presentation will draw on scientific work involving paleoimaging studies to include photography, endoscopy and radiography, conducted in Perú and will contrast field methodology with advanced imaging modalities. An assessment of available field methods and adaptations will be presented and their appropriate applications. The advent of more advanced paleoimaging technologies enhances the field imaging potentials in Perú. Newer radiographic and endoscopic instrumentation further increases the field imaging possibilities. A set of practice guidelines will be presented regarding the future direction of Field Paleoimaging in Perú including a triage decision making construct. An emphasis will be placed on the appropriate operation of these new technological advances.

A Field Radiographic and Endoscopic Study of the Mummies from Laguna de los Condores, Perú: A Paleopathological Analysis

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A radiographic and endoscopic examination of 209 of the 219 mummies recovered from Laguna de los Condores, Perú was initiated in the spring of 1998 in order to answer both bioanthropological questions and determine the presence of any Paleopathologies. A 1952 vintage Picker Army field radiographic unit, radiographic film, 14"x17" and 14"x36" cassettes, powered developer and fixer were transported to the Leymebamba, Perú, where the study was conducted. Once on site a darkroom was constructed using a PVC pipe frame covered with black plastic. Three tanks, one for developing, another served as a wash and the final for fixing, were placed into the darkroom. Once the films were fixed, they were transferred to a tank located in a large sink with running water for the final wash. Following the wash the films were hung on a line to air dry. The dry films were transported back to Quinnipiac University where radiologists made the initial interpretations. Endoscopy was conducted using a 6mm Industrial endoscope recording on Digital Video tape media. In 2003, an initial interpretation of the images was reported by a radiologist. Between 2003 and 2011 attempts were made to improve the quality of the less than optimal images before digitization with a flat-bed scanner equipped with a transparency adapter. In 2011, the digitized images were submitted to other radiologists for additional interpretations. The endoscopic images were interpreted on site. Several paleopathologies were diagnosed from the paleoimaging data collected, including pulmonary and skeletal conditions. The presentation considers the findings of those images employing the diagnosis by consensus model.

A Comprehensive Radiological Survey of Three Skeletal Populations

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In the years 2003-2010 a total of 182 individuals were excavated from two cemeteries in Southern Finland namely Porvoo and Pälkäne. The skeletons date from the 17th, 18th, and 19th centuries, although some individuals may even have lived earlier, during the medieval period. However, all these 182 individuals lived in a time when modern medicine and therapeutic treatments were unavailable.

For the present study all skeletal elements, except for the left femora and mandibles have been radiographed at the Department of Forensic Medicine, University of Helsinki. The purpose of this study was to find out how much additional information could be gained by a comprehensive radiological survey and to establish what might be missed during macroscopic skeletal analysis.

Our results reveal two individuals with possible signs of systemic disease. In addition, approximately one-fifth of the individuals showed other lesions not visible on the bone's surface. Cysts and sclerotic areas were the most common findings.

In conclusion, more research on the subject is needed. More skeletal collections ought to be studied radiologically to evaluate their full potential. Although basic osteological

research reveals most pathologies, more can be gained from a comprehensive radiological survey. This method is non-destructive but time-consuming and requires specialist equipment and expertise. However, the availability of digital radiograph facilities makes this effort worthwhile.

Symposium 3

The Contribution of DNA to Paleopathology and Population Genetic Studies

Coordinators

Evelyn Guevara

Raul Tito

New insights into the population history of pre-Columbian Peru and the demographic impact of the European contact by ancient DNA- and heterochronous data analysis

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Ancient DNA analysis together with heterochronous data analysis can be a powerful tool to reveal population dynamic processes in prehistoric populations. Combined with interdisciplinary data derived from e.g. Archaeology, Palaeoecology, and also Palaeopathology/epidemiology it can help to understand what formed the demography of ancient populations and the population genetic structure of today. For South America the number of ancient DNA studies is still small. Just recently there are a growing number of pre-Columbian populations typed for genetic markers relevant for population genetic analysis. But these few studies already show the potential of these methods to answer fundamental questions with regards to the prehistory of South America.

Here I report on several ancient DNA studies conducted by my research group to understand demographic processes in pre-Columbian southern Peru, and also on a continental scale. Issues addressed involve the influence of cultural- and ecological- change on the genetic structure, and migration patterns in the Peruvian Palpa area, the initial peopling of South America, and the impact of the European contact on the Native American demography. The results presented derive from the analysis of genetic markers relevant for population genetics (e.g. mitochondrial DNA, Y-chromosomal DNA), and some associated with immunologic response and adaptation (e.g. ABO-blood groups, H19-Gene) from several pre-Columbian skeletal collections, and complex demographic simulations with tools like BEAST and BayesianSSC.

Among other things I report on the first genetic study demonstrating that Native American populations suffered a significant, although transient, contraction in population size some 500 years before the present, correlating with the first European contact. The transient and severe character of this population decrease suggests that it was mainly induced by epidemic diseases that travelled across the Atlantic with the Europeans.

Studying the impact of Old World diseases on Native American populations via ancient DNA

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There is good evidence to suggest that prior to the arrival of the Spanish in 1492, South and Central American populations were the largest of any in the world. However, censuses performed by Spanish functionaries less than a century later show a drastic decline in both population size and distribution. Several accounts estimate that up to 95% of the indigenous population of the Americas died between the period of initial contact and the beginning of population recovery. Consequently, contact between the Eastern and Western Hemispheres in the sixteenth century represented an adaptive transition that shaped modern human bio-cultural diversity on a global scale.

We propose to use ancient DNA techniques to explore the selective pressures exerted by new pathogens on human populations. Our project aims are: i) to generate the first real-time picture of the genetic changes induced by epidemics in human populations using ancient DNA from a large number of specimens from pre- and post-contact Native populations from South America; and ii) to describe the genetic diversity of Native populations prior to European contact to test the hypothesis that they were immunologically ‘naïve’ to Old World diseases, and suffered very high levels of mortality as a consequence.

Ongoing research efforts include mitochondrial and Y-chromosome genotyping using multiplex SNP analysis, the development of DNA capture methods targeting immunogenes in ancient DNA libraries, and the use of Next Generation Sequencing platforms. Major outcomes expected from this project are a better comprehension of the biological impact of colonization on indigenous groups, as well as a better understanding of the parameters and driving forces behind human evolutionary history.

Mycobacterium tuberculosis complex detection in historic human remains: tuberculosis spread since 17th century in Rio de Janeiro, Brazil

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Paleogenetic analysis for tuberculosis (TB) was conducted on bone and sediment samples from the archaeological site of Nossa Senhora do Carmo church from Rio de Janeiro, Brazil, dating from the 17th–19th centuries. Forty samples were analyzed, corresponding to 32 individuals from 28 burials, 22 of primary type and 6 of secondary type. The samples were collected from the archaeological site through strict paleogenetic conditions and submitted to ancient DNA (aDNA) extraction. Cultural evidence of catholic religion, associated or not with

specific burials, was found. Interestingly, elements of African culture used on African–Brazilian cults, were also observed. In order to detect TB infection, aDNA hybridization with the molecular targets of Mycobacterium tuberculosis complex (MTC) IS6110 and IS1081 were applied. Additionally, the ancestry of individuals was assessed by human mitochondrial DNA (mtDNA) analysis of hypervariable segment I (HVS-I) polymorphisms. The results of aDNA hybridization demonstrated varying levels of MTC intensity in 17/32 individuals (53.1%), using the IS6110 target. The IS1081 MTC target showed lower sensitivity, confirming the TB positivity in 10/32(31.2%) individuals. The mtDNA analysis allowed the recovery of HVS-I sequences in 23/32 individuals (71.8%). The majority of these individuals (21/23, 91.3%) were of European ancestry, especially in primary burials. Haplogroups U, J, V, T, K, N, H and R, were identified with haplogroup U being the most frequent at 6/23 (26.1%). African and Amerindian mtDNA haplogroups were observed in two individuals in secondary burials. In conclusion, the study of TB ancient DNA in Brazilian burials from 17th–19th centuries, verified TB infection in more than half of individuals and the human mtDNA analysis revealed a predominance of European ancestry in this population. In spite of the ecclesiastic and aristocratic bias of the population of the study, the prominent contribution of Europeans in the introduction or spread of TB in New World is demonstrated.

Complementary morphological and molecular methodology in the study of prehistoric parasitism

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Prehistoric intestinal parasitism is generally known through traditional morphological analyses of ancient coprolites, intestinal tissues, or latrine sediments. As with modern parasitism, prehistoric parasitism presented inherent health risks to prehistoric individuals and parasite loads are often directly related to human behavior in diet, sanitation, and subsistence practices. Morphological examination is limited by a number of factors in relation to ancient specimens including distortion of parasite eggs and/or larva, absence of identifiable eggs due to decay and an inability to differentiate species based on eggs and/or larva present. Similarly, molecular approaches have their own limitations, including lack of DNA preservation, inhibitors of molecular chemistry, and DNA sequence homologies that challenge the specificity of the assays. We present a methodology that draws the morphological and molecular identification of intestinal parasites together in a complementary analytic approach. We demonstrate the effectiveness of this approach in a case study of coprolites from the region of El Zape, Mexico. In this case study, an initial microscopic observation suggested the presence of the roundworm *Ascaris*. Molecular approaches were then used to extract DNA from the microscope slide and amplify and sequence DNA from a region of the 18S gene found to be informative of taxonomic identification. The DNA sequence data did not identify *Ascaris*, but rather, *Physaloptera*, a close phylogenetic cousin. The presence of an unexpected intestinal parasite, one not often encountered in humans today, suggests entirely new interpretations of prehistoric health issues, behaviors, and ecological associations. This increased clarification and illumination of new information would not be possible without a complementary approach that includes morphological and molecular approaches.

DNA analysis of the ancient Chachapoyas, Amazonas, Peru

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Recovery of ancient DNA has become an increasingly important tool for elucidating the origins of ancient populations and their relationships. In this presentation, we report the results from the mitochondrial DNA analysis of the successive pre-Hispanic to modern populations of north Amazonia of Peru.

This study examines the population composition of the ancient Chachapoya people through analysis of mitochondrial DNA from 32 individuals from the Chachapoya period (800 to 1475 A.D.) and 5 individuals from Chachapoya-Inca period (1475 to 1532 A.D.). The DNA used in this study were extracted from the teeth and bones representing both sexes and varied adult ages excavated at Laguna de los Condores site.

To investigate the relationship between contemporary people and individuals who lived in ancient times, mitochondrial DNA haplogroup frequencies were compared. The distribution of mitochondrial DNA haplogroups will give us some suggestions about the population history of this area. It is safe to say that haplogroup frequencies remained relatively stable over time. Since 9 A.D. to today, this region has retained genetic diversity avoiding genetic drift or influence of Inca population. Our results provide new information about the patterns of genetic diversity in ancient Peruvian society, and its role in the formation of the ancestral Andean gene pool.

Symposium 4

Infectious Diseases and Their Epidemiological Impact

Coordinator

Sonia Guillén

Palaeopathology and evolutionary medicine working towards contributing to understanding present and future health

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Paleopathology considers the hard evidence from archaeological human remains for the origin, evolution and history of disease. Evolutionary medicine (Darwinian medicine) applies evolutionary theory to help us to understand why we get sick today. It is an alternative approach to how current medical science works. However, both evolutionary medicine and palaeopathology are clearly complimentary disciplines that consider the long, or deep time, view of the disease experience of humans but use an evolutionary approach to appreciate how disease has changed through that deep time. Nevertheless, both evolutionary medicine and palaeopathology have not, to date, been integrated to produce an even more useful view of how our disease experience over thousands of years has influenced what it is to be human. This paper will promote this clear complementarity by providing examples of recent research by the author, and others, that particularly illustrate how ideas about specific diseases today may be changed by taking an evolutionary approach.

The paper will be in two halves. The first half will provide examples of basic macroscopic analyses of disease over long time periods by the author (Roberts and Cox 2003),

but also the work of the Global History of Health Project based at Ohio State University in which the author has extensive involvement. The second half of the paper will deal with a research project funded by the Natural Environmental Research (Biomolecular archaeology of tuberculosis in ancient Europe <http://www.dur.ac.uk/archaeology/research/projects/?mode=project&id=353>), currently coming to a close in 2011 (Durham and Manchester Universities). The project ultimately aims to consider the evolution of the pathogen (bacteria) causing tuberculosis by analysing its DNA. The research has focused on almost 500 bone samples from individual skeletons with macroscopic bone changes of tuberculosis, from over 200 sites in Britain and the rest of Europe and dating from 500BC to the 19th century AD. The sites are from urban and rural contexts, from different latitudes and longitudes, and from coastal and inland environments, thus providing a wide range of ecological variables that potentially would affect the nature and developing strains of the bacteria. Initial screening of samples has been completed and by June 2011 the final data on bacterial strains will be available. The data will thus be available for presentation at this conference, and will be correlated with a number of variables, including the dating of the sites and their ecological contexts. Collaborations with Arizona State University's School for Human Evolution and Social Change undertaking similar research in the New World will be used to provide Old World and New World comparisons.

A case of saber tibiae of difficult paleopathological diagnosis

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This study focused on an intriguing prehispanic Muisca skeleton (#4, Prof. Virgilio Becerra's collection) from Usme archeological site, which is characterized by its thick saber tibiae, of slightly greater curvature toward their proximal ends, especially on the left one. The skeleton corresponds to a 30-35 year-old robust man, though taller (170 cm) than its peers, perfectly fit into the pre-Columbian cranial features of the Cundiboyacense plateau natives. Upon observation of CT-scanning plates and 3D reconstructions of the whole skeleton, both reactive periostitis and Paget's disease were ruled out due to the preservation of the cortico-medular ratio. Syphilis was also taken out of consideration in the lack of periostitis and caries sicca. The absence of stunting and bone deformities (e.g., skull and ribs) did not fit with rickets or vitamin D deficiency. Therefore, the paleopathological study raised more questions than answers.

Evidence of Treponematosi s in an Early Formative Population from the Asia valley (Peruvian Central Coast) ***

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A small sample of human skeletal remains from the Early Formative period of the Asia valley (Peruvian Central Coast) was analyzed in order to estimate the prevalence of treponematosi s in this population. The skeletons were examined for evidence of periosteal new bone formation (PNBF) and other lesions (e.g. lytic lesions and cloacae) that could be related to infections. Teeth were also examined for evidence of malformations associated with congenital syphilis (mulberry molars and Hutchinson's teeth). The diagnosis of treponematosi s was done when at least one of the following pathologies was present: Caries sicca, saber shin, and Mulberry molars or Hutchinson's teeth. The results were compared with the "SPIRAL" model

created by Rothschild and Rothschild (1995) and the environmental model proposed by Hudson (1965) to establish the most likely treponemal disease that affected this population.

It was observed that 4 of 16 adults (25%) presented strong evidence that support the presence of treponematoses, which affected 30% of the females (n=3) and 20% of the males (n=1). The female percentage increases to 50% when the possible cases are added. There was no evidence of infectious conditions among subadults. Both the SPIRAL and the environmental model support the presence of bejel or syphilis in the Asia population. Although our sample does not allow the ability to distinguish clearly between these two treponemal diseases, the comparison with a Baja California sample (Molto 2005) suggests that bejel was the most likely form of treponematoses present in the Asia population.

Beach life in prehistoric Brazil with treponemes

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Despite a decade-long research and many hypotheses proposed, the place of origin and timing of syphilis is still unknown. Apart from the difficulties in describing and classifying the treponemes, reaching differential diagnoses in archaeological collections is challenging. Various protocols have been put forward, but many regions of the globe lack systematic studies of treponemal diseases in human remains. One of them is non-Andean South America.

Here we present a systematic reappraisal of 768 individuals exhumed from 45 prehistoric groups that inhabited coastal Brazil between 5000yBP and 800 AD. This sample represents the totality of available individuals. Using three protocols for differential diagnosis (Powell and Cook, 2005; Rothschild, 2005; Hackett, 1975), we identified 25 cases of probable treponematoses (1 bejel, 12 yaws, 12 syphilis) and suspect of another 12 cases (4 bejel, 3 yaws, 5 syphilis). Furthermore, 41 individuals exhibited wormlike lesions and caries sicca on the skull as well as severe periostitis with thickening mainly on long bones, further increasing the number of people possibly affected with treponematoses.

Whereas these results do not pinpoint the origin of syphilis, they nevertheless show, together with other pre-Columbian syphilis cases in the New as well as in the Old World, that this disfiguring disease is indeed very old. On the other hand, we could not find any association of the number of affected individuals with the size of the site or with the number of individuals exhumed per site. Additionally, since the 25 diagnosed treponematoses cases are distributed over 31 from the 45 sites investigated (located across a strip of about 1500km and along a time span of more than 5000 years) there appears to be no clear pattern of temporal or spatial distribution. This suggests that treponematoses were common diseases, especially when considering the “osteological paradox”. The implications of these findings are discussed.

Symposium 5

Coprolite Studies and Paleoparasitology in South America

Coordinator

Inés Gárate

Rodents as Sources of Paleoparasitological Evidence in Archaeological Sites From Patagonia (Argentina)

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Rodents are hosts to several species of zoonotic enteroparasites. The aim of this work was to synthesize the paleoparasitological findings of rodent enteroparasites found in rodent coprolites and their predators, raptor pellets and small mammal feces sediments, collected from archaeological sites in Patagonia, Argentina. The samples were rehydrated and parasitic remains enriched by routine techniques. The records showed the presence of eggs of *Monoecocestus* sp., *Trichuris* sp., *Capillaria*, ascaridid, *Pterygodermatites* sp. and *Trichosomoides* sp. in human skeletal sediments and in rodent coprolites (Alero Mazquiarán, 212±35 years B.P.). From Orejas de Burro I (3.720-3.978 years B.P.), *Trichuris* sp. eggs were identified in sediments from a burial. From Cerro Casa de Piedra (CCP) eggs of *Trichuris* sp., *Aspidodera* and capilariid (7.920±130 years B.P.), and of *Trichuris* sp. and *Heteroxynema* (9.390±40 or 10.620±40 years B.P.) were collected from rodent coprolites, and also eggs of *Trichuris* sp. and *Capillaria* sp. from a canid coprolite (6.540±110 years B.P.). A raptor pellet was also examined from CCP, and eggs of *Capillaria* sp. (6.540±11 years B.P.), *Trichuris* sp., *Calodium* sp. and taeniid (2.740±100; 3.990± 80 years B.P.) were registered. From Alero Destacamento Guardaparque (6.700±70 to 3.440±70 years B.P.) were identified eggs of *Trichuris* sp., *Calodium* sp., *Eucoleus* sp., *Echinocoleus* sp., capilariid and *Monoecocestus* sp. In rodent coprolites from Cueva Huenul I (13.844±75 to 1.416±37 years B.P.) were found eggs of *Heteroxynema (Cavioxyura) viscaciae* (Oxyuridae) and *Viscachataenia quadrata*. The results suggest that the caves and rockshelters occupied by hunter-gatherers in Patagonia could function as environments suitable for the potential transmission of zoonotic parasites. The importance of paleoparasitological evidence in order to outline a better understanding of parasite ecology and biogeographic issues related to the establishment of zoonoses in the past, were also discussed.

Parasites and food remains in a Cynodont coprolite of the middle Triassic of southern Brazil

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The cynodonts are therapsids with mammalian characteristics belonging to a monophyletic clade that gave rise to mammals. Cynodonts emerged at the end of the Permian and diversified during the Mesozoic Era, especially in the Triassic after the mass extinction Permian/Triassic. In southern Brazil, at the Rio Grande do Sul state, there are numerous findings of fossils in sedimentary rocks dating from the Middle to Upper Triassic, including coprolites of carnivores cynodonts, allowing microscopic studies of diet and possible parasitism. This study aimed to identify their diet and parasites in coprolites of cynodonts of the Santa Maria Formation, Brazil.

The coprolites were collected by paleontologists and sent to the Laboratory of Paleoparasitology (ENSP/Fiocruz). The technique of dissociation was utilized in 10% hydrochloric acid, quickly interrupted by successive washes in distilled water followed by preparation of slides observed by optical microscopy. Pollen grains and fungal spores, hair, starch and phytoliths were found. Under microscopy, an unidentified nematode egg and mite fragments

were found. It should take into account the possibility that this mite could be a free living species, a coprophagic species, or even recent contamination.

Even with few studies involving parasitism in extinct animals, protozoan cysts and helminth eggs were previously described in the Cretaceous dinosaur coprolites. Nematode larvae were found in coprolites of extinct hyenas, dated 1.5 million years ago in Italy. Regarding the analysis of diet, muscle fibers were described in the Tyrannosaurids Cretaceous coprolites. Our findings of nematode eggs, even though up to now not identified, brings new contributions to paleoparasitology and studies on the origin and evolution of parasitic infections. By the age of the coprolites, which date 230 million years, these findings may reveal important information about the life of this extinct animal.

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Dealing with increasingly older samples: the experience of the laboratory of paleoparasitology in Fiocruz, Brazil

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For over 30 years of existence of the paleoparasitology lab, innumerable parasites were found in all kinds of archaeological materials. Early challenges dealt with technical and personnel training and diagnostics. Nowadays these challenges still exist and were added to the preservation of samples accumulated in the scientific collection over the years. With over 2400 samples, almost all with liquid residue, new challenges emerged with the need of reanalysis of long time re-hydrated samples.

Fluctuation in the temperature of the samples, the proliferation of fungi and bacteria, and especially the natural process of deterioration of eggs, larvae and cysts, jeopardizes the accuracy of diagnoses, since parasites degenerated for taphonomic processes, can be overlooked.

Moreover, modifications in the natural state of the material such as immersion in liquid media, for example, may increase chances of compromising the conservation and the appearance of the eggs and other evolutionary forms. Disruption of shells, loss of opercula and polar plugs are some of the changes observed in eggs from these samples.

Despite the use of new techniques, such as diagnosis by aDNA, many of the findings in this science are still thanks to the most traditional methodology employed, optical microscopy and therefore ensure the preservation of samples in their natural state, reducing the use of chemicals and time between rehydration and analysis which can facilitate the conservation and identification of parasitic structures.

These difficulties, combined with the pursuit of samples in areas with little-known features of conservation in littoral sites as sambaquis, has led paleoparasitology to develop new protocols for collection, handling and conservation of samples in order to increase parasitological records.

Finally, to increase the visibility of coprolite collections high-lighting their scientific importance makes it easy to obtain the necessary support for their preservation.

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Paleoparasitological analysis of XVIII century humans remains from a slave cemetery of Rio de Janeiro, Brazil

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Rio de Janeiro city was the capital and the main commercial center of Brazil during the colonial period, as a consequence the city suffered massive urbanization. The transatlantic slave trade brought to Brazil more than 3 million African slaves. The Praça XV cemetery was a slave burial place during the colonial period, dating from the early 18th century. It was located in the port area of Rio de Janeiro city bay.

A paleoparasitological analysis was performed in human remains dated from the 18th century collected from the archaeological Praça XV cemetery. The skeletal series is stored at the IAB-Institute of Brazilian Archaeology (Instituto de Arqueologia Brasileira). The samples are in a good state of preservation, with evidence of washing and brushing. Sediment samples were removed from the sacral foramina of 10 individuals. The sediments constituted mainly of sand were rehydrated in 0.5% trisodium phosphate solution during 72h at 40C. The paleoparasitological investigation was conducted by spontaneous sedimentation previous to microscopic analysis. The results revealed that 7/10 of individuals were infected by intestinal helminths and/or protozoa. *Trichuris* sp., *Ascaris* sp. and *Taeniidea* eggs were found in 5 individuals and protozoa cists were observed in 2 individuals.

It is known that the slave population was subject to poor nutrition and unsanitary conditions that allowed the spread of infectious diseases. The human remains retrieved from this archaeological site provided an opportunity to study infectious disease during the Brazilian colonial period, as there was good preservation of the material. Previous to this, there had been an absence of data related to this period.

This study showed the importance of the analysis of sediment from human remains preserved in museum or scientific collections, even after they were washed. This is the first report of intestinal parasites recorded for the Rio de Janeiro during the Brazilian colonial period.

Discovery of enteric parasites in coprolites of pre-Columbian population of Caral-Supe, Peru

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This 2008 – 2009 study determined the presence of parasitic infections in the pre-Columbian population of Caral-Supe. Nineteen collected and recorded coprolites were rehydrated with 0.5% trisodium phosphate. For parasitological examination, simple and direct methods of concentration were used. 84.21% (n = 16) of the coprolites had protozoan cysts identified as *Entamoeba histolytica*, *E. dispar*, *Giardia lamblia*, forms of *Blastocystis hominis* and *Entamoeba coli*. Moreover, *Entamoeba hartmanni*, *Endolimax nana*, *Iodamoeba bütschlii*, and *Acanthamoeba* sp.cysts were also observed. It is concluded that the prehistoric inhabitants

of Caral were infected with protozoa. Just as it is the case today, fecalism and possibly crowding, must have facilitated the presence and spread of these enteric parasites in the ancient population of Caral.

Symposium 6

Paleopathology in South American Mummies

Coordinator

Guido Lombardi

Pathology or taphonomic change? The importance of distinguishing the two in mummy studies

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Ruling out taphonomic change is an important first step in any differential diagnosis of possible bone or soft tissue pathology. Unfortunately, some paleopathological diagnoses have been made in mummies without considering the post-mortem history of a particular body. Occasionally this results in the production of scenarios that, while they may appeal to the popular press, are based on very limited evidence. These situations often arise when medical specialists uncritically apply a clinical perspective to ancient bodies without considering the complexities of mortuary practices and taphonomic alterations that may occur (1) during preparation of the body or in the tomb, (2) during transport to the laboratory, and (3) during museum curation. In this paper, we review several examples of problematic diagnoses of pathology and cause of death in mummies, where taphonomic issues should have been more fully addressed.

Study of Pediculosis Capitis in Early Populations of Northern Chile

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The objective of this study was to evaluate the presence of pediculosis capitis in early populations of Northern Chile (Fondecyt project 1100059). Pediculosis capitis caused by *Pediculus humanus capitis* is one of the most common ectoparasitoses in the world. Nevertheless, its antiquity and paleoepidemiology have not been fully studied in Chinchorro populations.

Forty-three mummified bodies from the Arica – Camarones coast, dating from the Late Chinchorro period (ca. 2000-1500 B.C.), were analyzed. Each mummy's left temporal and occipital areas were systematically surveyed for nits/eggs, visualizing them with a hand magnifier (10 ×). Three counts were made for each area. Also, the head of each mummy was inspected to assess the presence of *Pediculus humanus capitis*. Hair and ectoparasites were sampled for both optic and electronic microscopy analyses.

About 74% (32/43) of the mummies resulted positive to nits/eggs, with a range of 1 to 43 nits per individual and an average of 7.3 nits (S. D. = 8.4). In five cases, up to 2 specimens of *Pediculus humanus capitis* (nymphs or adults) were demonstrated. Microscopic analyses revealed all stages of the ectoparasite, including operculated and non-operculated eggs, and morphological details such as chorionic aeropyles, gonopods, and spiracles.

The results demonstrate that the early populations studied were significantly affected by pediculosis capitis. The fact that 7 out of 10 individuals were infested suggests that these people developed their daily or nightly activities in very circumscribed places, which facilitated the transmission of these ectoparasites. Local literature shows that the Chinchorro lived in small huts, a fact that could have contributed to head louse infestations. The prevalence of pediculosis could be used as a bio-indicator to assess the degree of crowdedness among prehistoric peoples.

Demonstration of tuberculosis in a pre-Columbian Colombian Mummy by ribotyping of *Mycobacterium tuberculosis* DNA

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The objective of this study was to assess the presence of *Mycobacterium tuberculosis* DNA in a pre-Columbian Guane mummy with an evident Pott's disease. The mummy belonged to the pre-Columbian Guane society. According to its Casa del Marqués de San Jorge Archeological Museum accession number, Mom 003 was found in a Santander Department cave, and donated to the Culture Promoting Fund of the Banco Popular more than 30 years ago. The mummy, who had already been sexed through chromosome-Y PCR, was CT-scanned and sampled for lung, spine, and skin tissues to screen them for TB. The CT scans clearly showed the presence of spinal tuberculosis, responsible for the mummy's sizable angular kyphosis (Pott's disease). DNA obtained from the pulmonary tissue was ribotyped for the presence of the very specific 16S segment of *M. tuberculosis* rDNA, which turned out positive. Therefore, this study demonstrates the existence of tuberculosis in pre-Columbian Colombia.

San Lorenzo Island, Bioarcheology Sanctuary: Studies and Perspectives

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This paper presents the results of the studies of funerary contexts recovered from the cemeteries of La Cruz (Pre-Columbian) and Panteón coves (Republican). Moreover, the paper proposes that San Lorenzo, given its rich natural and cultural patrimony, should be considered as a unique bioarcheological laboratory.

The methods included: macroscopy, CT – scanning and plain radiology, and in some instances, microscopy and microbiological molecular and genetic analyses.

Proceeding from La Cruz cove cemetery (A.D. 14 – 16 centuries), six mainly skeletonized individuals and some surface bones were studied. Given their pre-mortem treatment and funerary paraphernalia, the most significant were those of an aged female weaver and a fisherman. Likewise, seven naturally mummified bodies recovered from El Panteón cove cemetery (19 century), were studied. Five of them were uniformed military men, including a Peruvian soldier who had probably been killed in 1881. The body of a Chinese immigrant who died during his stay at the quarantine station before entering continental land, was also studied.

Despite San Lorenzo being so close to Lima, and therefore had been the object of significant looting, it still holds in its territory an invaluable legacy. Its patrimony is not limited to history and culture, it encompasses a rich geological and a biological preserve which thoroughly summarizes the natural history of this part of the world.

Paleopathology in Paracas Necropolis Mummies

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In 1927, the Peruvian archaeologist Julio C. Tello and his team found in Paracas peninsula, Department of Ica, the cemetery of Wari Kayan, which held around 500 mummy bundles. They identified the buried individuals as belonging to the Paracas Necropolis society (200 B.C. – A.D. 200). The degree of preservation of some bundles was surprisingly good, as well as the state of their contents: bodies and offerings, mainly cotton pieces of clothing embroidered with wool threads of different colors.

With the passing of time, given their appealing presence, most studies involving these bundles have been directed to the embroidered pieces of clothing. To a lesser degree, they have involved the bodies enclosed in them. This research attempts a first approach to studying the health of the population that was buried at the Wari Kayan Necropolis. The sample comprises the bodies of 12 individuals belonging to both sexes. Conventional skeletal and dental analyses were performed to determine sex, age, stature, health, and pathologies. As a result, marked differences between the sexes were observed regarding the distribution of skeletal robusticity markers, as well as spinal degenerative conditions, trauma, dental attrition, cavities, dental abscesses, among others. Even though these are preliminary results only, they shed some light on the lives these individuals and the society in which they once lived.

Intentional Natural Mummification and the Construction of Identity among Ancon Site Museum's Mummy Bundles *Winner**

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This work is based on the study of individuals recovered from the Ancón pre-Hispanic cemetery, located in the desert of the central coast of Peru. This study noted the different types of treatments and manipulation of the body, which accompanied the preservation of these individuals. These treatments and manipulation are typical of the natural intentional mummification. This study also noted the construction of bundled mummies with different types of wrappings.

The studied sample is comprised of 35 individuals, males, females and children, from a total of 55 bundled mummies under the custody of the Ancon museum. This sampling was carried out as part of the Bundled Mummies Preventive Conservation Project of Museo de Sitio de Ancón (2009 – 2011).

Different characteristics were observed as a result of the body manipulation which led to natural mummification. Also, the types of wrappings and the external treatment used were studied. It was noted that a postmortem identity was created for each individual. To assess the latter, biological profiles, including health markers, were recorded.

To conclude, comparisons were made with characteristics observed on individuals studied at other sites from the Central Coast, ranging from the Middle to the Late Horizons; and from the Northern Coast, to evaluate atypical body manipulation, when present.

Symposium 7

Social Change and Disease: Contributions of paleopathology to the Study of the Colonial and Republican Periods in America

Coordinators

Elsa Tomasto Cagigao

Douglas Ubelaker

Diseases that affected San Fernando del Valle's society, Catamarca, Argentina between 1857 and 1884

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This paper presents the results of researching Choya -- San Fernando del Valle's historical cemetery between 1857 and 1884, in order to identify the diseases that affected its population. This was accomplished based on correlating historiographical and documentary data (government, municipal, and church records; including censuses and death certificates) with bioanthropological information. Thus, demographic and health profiles were generated, including age, sex, and causes of death (i.e., infectious diseases such as smallpox, measles, cholera). The results provide a glimpse of the city's economy and culture during the second half of the nineteenth century, as well as it reveals the state of health, hygiene, and medicine at that time.

Herniated discs in a contemporary skeletal Series from La Plata, Argentina

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The most recognizable skeletal evidence of disc hernias are the Schmorl's nodes, which are depressions in the upper and/or lower vertebral bodies. They result from defects in the intervertebral discs, which protrude into the spongy tissue of the body of the vertebra. Causal phenomena involved are microfractures, osteoarthritis, other degenerative changes, and chronic overload. The aim of this study was to establish the prevalence of Schmorl's nodes in a contemporary, documented skeletal sample of 100 individuals belonging to Dr. Romulo Lambre's osteological collection (FCM-UNLP). Complete vertebrae were analyzed from 33 female and 67 male individuals. Macroscopic observations were made with a 10X magnifier, dividing the upper and lower faces of each vertebral body into three areas: central, canal, and peripheral. Affected spinal area, sex, and age at death were taken into account. The severity of each injury was rated as small or large depending on its diameter and depth. 114 Schmorl's nodes were tallied on 27 individuals (27%). Out of 1.575 analyzed vertebrae, 92 (5.84%) showed evidences of herniated discs. T4 - L4 vertebrae showed the highest frequency; T11 being the most affected (27.27%), without any sex predominance. Very little occurrence of this condition was observed in the cervical column and sacrum. The majority of lesions were small and centrally-located. These results are consistent with previous clinical and osteological studies.

Paleopathological diversity and Health in Post-Contact Peru: Comparing biological stress, diet, trauma, and lifestyles between Eten and Mórrope, North Coast of Peru

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New World colonization was planned as a one-dimensional process of demographic collapse and extinction of native peoples. Bioarcheological research out of the central Andes has revealed a range of responses to conquest among native survivors. After a first phase in Mórrope, this long-term bio-historical project on the adaptive transition in post-contact Lambayeque, moved to Eten to include human remains from two colonial churches over three field seasons (2009 - 2011). Paleopathological data obtained reveal complex native experiences and subpopulation contrasts within colonial Lambayeque times. Initial analyses of 475 burials indicate that native Eten Muchik people were healthier than their contemporary Mórrope neighbors. They endured and survived greater acute stresses during childhood, evidenced by the prevalence of enamel hypoplasia. Moreover, they experienced less chronic anemia in childhood and less chronic diseases in adulthood, which might have stemmed from Eten's rich and unique micro-environments. Oral pathology suggests that Eten people consumed a marine, low carbohydrate diet. Paradoxically, four mass graves from early colonial Eten show a high mortality event inexistent in Mórrope. Eten also presents more severe OA, work-related trauma (broken femoral neck, ribs), and deadly violence on children cases. In sum, paleopathology allows a glimpse of the survivors of the conquest in Lambayeque and their descendants, something that had not been possible up to now.

Living conditions and health in Republican Bogotá: Characterization of a sample of bone paleopathology from Bogotá's Central Cemetery

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This paper discusses preliminary results of osteological and paleopathological analyses linked to a 2.5-yr archaeological project developed in Bogotá's central cemetery, Colombia's largest. The 4,000 sq-m sampled area, *Globe B*, was used to bury low income people from 1873 to 40 years ago. Over 800 primary and secondary burials, about 2,300 people, were recovered; bringing back bygone historical information, memories, and traditions. Bioanthropological analyses were performed through random sampling. Paleopathology study reveals evidence of precarious living conditions, heightened stress, and occupational injuries, reflecting a limited access to health systems. The infectious, degenerative, and traumatic conditions observed allowed the reconstruction of health care models, as well as medical and even mortuary practices. All in all, paleopathology permits a better understanding of the socio – economic and cultural living conditions of Bogota's society over the past 150 years.

Symposium 8

Bioarchaeology of Sambaquis

Coordinator

Sheila M.F. Mendonça de Souza

Modified human bone from the litoral of Brazil

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The word 'bioarchaeology' has come to have many meanings, ranging across scientific specialties and from field to laboratory. A particularly useful meaning is the application of the methods of physical anthropology to problems of archaeological interpretation. Modified human bone is used for the manufacture of implements or ornaments in many cultures. This practice raises questions about the trajectories through which human remains become objects, shedding or retaining their original identity and acquiring new meanings. A review of the rich historical, ethnographic and archaeological record for peoples of the Litoral of Brazil underlines the complexities of this practice and its interpretation.

A human molar with a cervical groove recovered from a rock shelter site in Rio de Janeiro state is presented as an example. An unusually large range of interpretations is possible. This tooth might be the residue of a disturbed burial, and thus simply constitute human remains. It may be intentionally or accidentally shed from its owner in life. Such separated body parts can have astonishing diverse symbolic content. In contrast, the cervical groove may constitute evidence for therapeutic dental treatment and/or extraction, practices that have a world-wide distribution. Alternatively, the tooth may have been grooved for suspension or attachment, uses that are particularly extensive in Brazil.

Oral pathology, radiography and microwear analysis assist in evaluating these interpretations. However, the extensive museum collections of ethnographic objects manufactured from bones and teeth provide hints about context and symbolism that cannot be recovered from scientific analysis alone.

Osteoarthritis in Human Bone Remains from Shell Middens of Southern Patagonia

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Osteoarthritis (OA) in human skeletons recovered in shell middens of Southern Patagonia are explored in this work. Also, their possible relationship with the activities described by historical and ethnographical accounts for terrestrial and marine hunter-gatherers of this region is discussed. The presence of OA in shoulder, elbow, wrist, pelvis, knee, hand, foot and vertebral spine was studied in adult skeletons from Tierra del Fuego. Skeletons were classified in those associated with shell middens and marine diets from stable isotopes and those recovered in other archaeological contexts, linked to terrestrial diets. Osteoarthritis was diagnosed when eburnation was present, or when two or more of the following joint lesions were observed: marginal osteophytes; new bone formation on joint surface; pitting on the joint; alteration in joint shape. The skeletons recovered in shell middens and associated with marine diets showed OA in upper limb, dorsal and lumbar vertebrae and pelvis. Moreover, no relationship between OA with age and sex was observed. On the contrary, skeletons associated to terrestrial diets showed more affected joints of lower limbs, pelvis and dorsal/lumbar vertebrae, with increasing frequency with age. The results suggested that activities related to marine diets, like rowing and harpooning, could have favored the development of OA in upper limbs on these particular hunter-gatherers populations, different from the ones observed on populations based on terrestrial economies.

Markers of occupational stress among shell mound builders from Rio de Janeiro state: Differences in cultural choices, environment and lifestyles

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Studies of markers of occupational stress began to be developed with pre-colonial coastal Brazilian series only during the last decade. Although some general patterns can be observed, data about musculoskeletal stress markers, articular degeneration, spondylolysis and Schmorl's nodes indicate high variability on affected individual's frequencies and/or intensity. In Rio de Janeiro state area, although preliminary, data point to two different sets among shell mound builders, one of them, represented by Ilhote do Leste series, with intense muscular demand and high exposure to stress injury risks, and low difference between the sexes; and the other, represented by Beirada and Zé Espinho series, with lower levels of muscular workload and lower exposure to stress injury risks, and greater difference between the sexes.

These differences were interpreted as the result of cultural choices and environmental characteristics of each area. These results place in check the traditional homogeneity biocultural model, which results mainly from general similarities founded in many osteological studies after the second half of the 20th century. Consequently, a new focus in site variability and singularities, interpreting them in their proper context, is growing among researchers to better reconstruct shell mound builder societies.

The people of Jabuticabeira II, again – evidences of life activities, social organization and phenotypic traits based on muscle-skeletal stress markers

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Although Brazilian shell mounds are magnificent past constructions, just a few studies have been conducted about possible occupational stress markers that its people might have presented. Even so, most of these analyses are based on osteoarthritis and, despite being a good stress marker, it is not enough to tell us about life activities, typical phenotypic traits and features of social structure.

In this scenario, musculo-skeletal stress markers emerge as a powerful tool to answer these questions, especially for ancient populations, with a lack of ethno-archaeologic and ethno-historic references on life style. Based on human remains of about 100 adults, the present work a) presents the distribution of these muscle markers among people of the Jabuticabeira II shell mound (Santa Catarina state – Brazil), b) explores if there are differences in age and sex regarding the intensity and location of major muscle involvement (as seen through markers of robusticity), c) tries to establish the typical phenotypic traits of the Jabuticabeira II. Until this moment, we standardized the methodology, so the intra-observer error could be less than 20%, which is acceptable due to the state of preservation of the sample. We found higher frequencies of robusticity on the lower than the upper limbs (in contrast to the current literature on Brazilian shell mound groups) in all age classes and in males and females.

Finally, the frequency distribution of robusticity degrees shows that among adult males most of the entheses (73.26%) showed severe, and some showed medium and mild degrees of robusticity (20.35% and 6.40% respectively). In contrast, adult females show a much more homogeneous pattern, where only 48.75% of the entheses show severe, and 32.1% and 19.17% show moderate and mild robusticity degrees, respectively. These differences in distribution

patterns of robusticity between males and females could be related to specificities of social structure yet unknown.

Roca Verde in Ilo, Peru, and the bioarchaeology of Pacific Sambaquis

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Roca Verde is a cemetery located on the sea, 8 km north of the port of Ilo, in the district of Pacocha, in the region of Moquegua. It is 5 m.s.n.m. and has an area of 1,007 ha. extension. It was identified in early 1994 for campers who found human remains. In the rescue phase archaeological site was called Camp Evangelista. Later Sonia Guillén and Carlos Del Águila made the first field campaign in 1995. Maybe recovered sample of human remains that have broader for Early horizon area. The material testimony abarcadel Archaic, Formative period and also recovered a context possibly Tiwanaku. We identified 74 burials funerary contexts between themselves (33), burials disturbed (19 contexts) and features (22 contexts). The material malacological 40 funerary contexts fueron analizados by Manuel Gorriti. Sus specialist studies report Conchalepas offerings conchalepas species, using containers that species and type de Choromithylus chorus and beads necklace beads made con Olivas peruvianas. Traces paleopathological in human remains closely reflect activity related to exploitation of marine resources.

Mortality, funerals and anemia in sambaquis: is it possible to re-think infections?

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Infectious diseases are universal causes of mortality and morbidity for natural populations. Paleoepidemiology of infections is a great challenge for bioarchaeologists, both because many infections will leave no signs on the skeletons, and because the signs are seldom specific. Stress indicators, periosteal reactions, porotic hyperostosis and cribra orbitalia are among the indirect signs of infections considered in paleoepidemiology, but direct evidence of the etiologic agents responsible for infections, even aDNA based, are scarce.

In the Brazilian prehistoric coastal sites the infections have been claimed to be one of the important elements in the pathocenosis of some populations, although no direct evidence of pathogens were confirmed up until now. The sambaquis are intentionally built shell mounds found in Brazil. They were mainly used for funerary purposes, but for decades they were considered middens of food refuse, a potentially contaminated place used as settlement.

Associated with people supposedly having an affluent and more sedentary lifestyle, the sambaquis were also thought to represent a special paleoepidemiologic condition.

The increasing information about the archaeology of sambaquis, especially about building activities and funeral use are changing the scenario for paleopathological interpretation. The burial rites, the use of fire in the preparation of the mounds/funerals, the local and regional differences between sites, the demographic meaning of the biggest mounds, mobility and contact, among other elements, must be now considered in the discussion of paleopathological data.

Are there alternative explanations to periostitis and anemia, if there is no significant increase in coastal populations? How to explain PH and CO if diet, sanitation or endemics are not the problem? What can funerals tell us about the mortality and the meaning of the cemetery demography in sambaquis? Rio de Janeiro and Santa Catarina state coastal sites are used here to illustrate such a discussion.

Symposium 9

Dental Paleopathology

Coordinator

Elsa Tomasto

Pathology and Dental Trauma at La Capitana, Huachipa: A case from the Archaic and Early Formative in the Rimac valley, in Lima, Peru

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This study indicates that there was a higher tendency for Archaic and Early Formative women of the central coast of Peru, to develop dental diseases and trauma. We analyzed the proportion caries, according to their location: occlusal (OSC), enamel surface (EC), and root (RC), as well as the loss or erosion of the tooth surface, considering splintered and fractured teeth in the study population. The results show a clear predominance of RC and OSC caries in women, but not EC caries, which affected mostly infants and children. Overall, women not only developed a greater prevalence of dental caries, but also the more severe stages of demineralization in each type of lesion. This evidence, along with a marked prevalence of dental wear and fortitious oclusodental chipping suggest that adult women developed a particular activity in the settlement, probably linked to the daily processing of a rich whole-grain and fibrous diet, and / or to the performance of other subsistence task that continuously stressed their teeth. This argument is supported by the finding of isolated cases of hypercementosis.

Patterns of oral pathology and social status during the Andean Late Intermediate Period: The case of Los Pinos – Huacho cemetery, Peruvian Central Coast

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The study of social complexity processes has been approached archaeologically from several perspectives, one of them the biologic. Several epidemiological and bioarchaeological studies have found differences in the individual health-disease patterns according to their localization in social classification scales.

This relation, strongly associated with different lifestyles and mainly with differences in the access to some types of foods has been poorly studied in the Central Andes, where despite the deep social divisions, there still prevails the idyllic idea of sufficiently fed populations and homogeneous diets to the contact moment.

This work analyzes, from a comparative perspective, the oral pathology patterns of 200 individuals excavated in 2007 in Los Pinos necropolis, a farmers-fishermen settlement located in the lower valley of Huaura, in the Peruvian Central Coast, dated to the Late Intermediate Period (1000-1470 AD).

The oral pathology patterns (caries, periodontal disease, abscesses, enamel hypoplasia, hypocalcifications, and dental wear) were analyzed in accordance to age, sex and social status (inferred from the complexity and richness of the funerary contexts) and are explained

considering the inventory of dietary species founded in the site and the ethno-historic information available for this region.

The preference for carbohydrates in the diet, the particular kinds of food preparation and some common habits like coca leaf chewing and maize beer beverage explain some notable differences between groups in the community.

Oral health and diet in hunter-gatherers from arid environments: the case of the lower basin of the Colorado River (Argentina) during the Late Holocene

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In the lower basin of the Colorado River (eastern Pampa-Patagonia transition, Argentina) different lines of evidence were addressed in order to explore the subsistence of hunter-gatherer groups during the Late Holocene (3000-250 years BP). Some evidence indicates that towards the final Late Holocene (1000-250 years BP) changes in prehistoric diets occurred. In this sense, the subsistence model generated for the area on the basis of the archaeofaunal analysis proposes a resource diversification process for this lapse (e.g., terrestrial, marine and freshwater species) and an economic intensification strategy. Studies from the lithic technology indicate standardization and a greater investment in tool design, particularly on milling artifacts that would indicate an increase in the consumption and probably intensification in vegetable resources. However, values of stable isotopes on human bones do not indicate a change in diet throughout the Late Holocene. This line of analysis suggests a food intake based mainly on animal protein (e.g., terrestrial herbivores), supplemented with fish.

The aim of this paper is to analyze the bioarchaeological sample recovered from the study area in order to assess oral health indicators that in turn allow further discussion regarding the subsistence model proposed for the Late Holocene. A total of 943 teeth and 1197 alveoli belonging to 54 maxillaries and 51 jaws were analyzed. Caries, abscesses, antemortem loss, dental calculus and periodontitis, as well as physiological adaptation processes such as dislocation and tooth wear were the adopted indicators for the analyses. All material was macroscopically analyzed with the naked eye and using a binocular magnifier glass (2X and 4X). The results obtained here are evaluated and integrated into the discussion with those obtained from the other lines of evidence previously mentioned, in particular, isotopic studies.

Dental caries and diet in pre-Hispanic populations in the valleys of Palpa, southern coast of Peru (3.500 BC – AD 1.000)

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The objective of this research was to explore the relationship between dental health and changes in archeology, bioarchaeology, and paleoecology in the northern part of the Grande river, Nasca, between 3,500 BC and AD 1,000. According to previous archeological investigations, changes in the region during this period were varied and deep, from the adoption and development of agriculture to the evidence of Wari empire traits. Moreover, paleoecological studies show that during this period there was a gradual desertification process which reached its highest levels during the time the Wari reached the region. Previous bioarchaeological studies are numerous; stable isotope analyses indicate that available resources

varied in time and space. Similarly, osteological studies outlined changes in health levels over time, while aDNA revealed a greater variety of mitochondrial haplogroups starting from Nasca. Previous research on dental health in the region is difficult to interpret. This study examined the decay and attrition in 145 individuals from the Archaic Period, Early Horizon (Paracas), Early Intermediate Period (Nasca) and Middle Horizon (Wari). While the Hillson method was applied for recording and quantifying caries (1996, 2001), Smith (1984) and Hillson (2001) scales were used to evaluate attrition. Results indicate that there was a mixed economy during the Archaic. In addition, both caries and attrition steadily increased over the Paracas, Nasca, and Wari times. Causes include the introduction of practices that led to higher attrition levels between Paracas and Nasca, and increased consumption of cariogenic foods during the Middle Horizon. For the Nasca, it was also established that some oral health differences may have been related to differences in status and gender.

Symposium 10

Paleopathology in the Zooarchaeological Record in South America: Problems and Possibilities

Coordinators

Patricia Maita

Richard Thomas

Paleopathological analysis in guanaco: Contributions to the discussion of health status in a sample zooarchaeological from the Calera site (Argentina)

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In this work the postcranial bone pathologies of guanaco (*Lama guanicoe*) from the Calera archaeological site (province of Buenos Aires, Argentina) are analysed. This site corresponds to a ritual deposit, repeatedly reoccupied by hunter-gatherers during the late Holocene (ca. 3400-1700 years BP). Zooarchaeological analysis previously carried out on the bone sample determined a minimum of 30 individuals with a significant percentage of prime adults, followed by subadults, crias, juveniles, and to a lesser extent, senile, with a slight predominance of males. The aim of this study is to determine the diversity and prevalence of diseases present in the postcranial bone sample and evaluate the health status of the prey exploited by human groups. A total of 1,975 bone specimens were analyzed macroscopically, differentiating those with degenerative lesions, traumatic, infectious, and congenital. Different types of bone pathologies were recognized, with prominence of traumatic and degenerative. The results are compared with those obtained previously in a reference sample of guanaco from the NE of Patagonia (Argentina). This work provides an understanding of the etiology of the observed diseases and discusses the possible connection of these with human hunting.

Osteological Evidence of Pack Animals in Conchopata

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Caravans of camelids are a socioeconomic topic not too much studied in Andean archaeology. Few studies have determined the presence of pack animals from analysis of archaeofaunal contexts. The osteological evidence, in addition to the discovery of foreign material, is the most direct indicator of the existence of caravans.

This presentation shows the results of the zooarchaeological analysis of 317 camelid bones recovered on Conchopata (highlands of Peru), specifically camelids foot (metapodia and phalanges) found in a circular ritual room (EA 143-B). The pathologic lesions found in 31% of the sample occur primarily on robust muscle attachments, degenerative joint disease and extension of the articular surfaces.

Symposium 11

Biology, Culture and Environment

Coordinators

Martha Palma

Corina Kellner

An Isotopic Study of Breast Feeding in a Prehispanic Caribbean Culture

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In order to discuss the relevance of breastfeeding in ancient human populations, meaning as the practice which involves many different aspects related to the human adaptive behavior, in the present document we consider that its recognition in the osteological analysis may help to clarify some aspects that are not easy to observe solely by skeletal observation; therefore we consider that the isotopic analysis allows us to understand this kind of child care with better accuracy, as the $\delta N15$ levels found in child bones are interpreted like a sensible marker that shows the practice of breastfeeding.

After a deeper osteological analysis of a Colombian Caribbean Prehispanic funerary sample, the skeletal remains of one child were found, in which the $\delta N15$ isotopic levels, associated with nonspecific physiological stress markers, suggest the possibility of an early weaning or the suppression of breast feeding starting in the first few years of life, proposing several scenarios where this kind of behavior might occur. Because of these findings, now it is possible to propose some alternative hypothesis about the child care in that period, as well as a better understanding of the biocultural dynamics performed by the ancient populations in general.

Role of Head artifacts in the Spread of *Pediculus capitis* in pre-Columbian northern Chile

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The role of head ornaments and utensils in the spread, maintenance, and/or removal of ectoparasites in pre-Columbian northern Chile is discussed. Scalp lice, *Pediculus humanus*

capitis, better complete their life cycle while not disturbed by grooming. A local literature review led to our focus on turbans, caps, nit-removing combs, and hair length. Archaic peoples (3,000 -1,000 BC) wore uneven loose hair. In the Formative (ca. 1,000 BC – AD 300), both genders began wearing bulky corded turbans. Caps and combs' use spanned the Middle (AD 500 -1,200) and Late Intermediate Periods (AD 1,200-1,400). If turbans had been worn before death, they would have created a suitable environment that promoted *P. humanus capitis* life cycle. The appearance of small nit-removing combs – akin to modern ones, made with cactus spines, strongly suggest that pediculosis capitis was a recurring problem on both adults and children during the Middle and Late Intermediate Periods.

Poster Presentation Abstracts

Repetitive Strain Stress among Late Formative camelids from Punta Blanca, Lurin Valley

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Punta Blanca salvage project began in 2006 to test this Late Formative (300 - 100 BC) site's hypothetical role as a lime exploitation and trade center. Accordingly, animal remains were identified in the filling materials of 265 human burial pits, as follows: Camelids -- mostly llama (*Lama glama*) 53%, deer 45%, and frogs, rodents, birds, and seashells 2%. Llama remains show first knuckle periostitis, healed patellar, carpal, and tarsal fractures, pelvic enthesopathies, and increased blood supply around long bones' joints. These observations support the idea of burden llama caravans being present at the site, since their remains evidence their rough working conditions though their repetitive strain injuries.

A Middle Horizon Case of metastatic Cancer from Zapallal, Lima

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Cancer is nearly absent in the Andean paleopathological record, which is generally explained by the shorter life expectancies of the past or by misdiagnosing. A salvage project in Zapallal, 32 km north of Lima, unearthed eight Chancay (Middle Horizon - Late Intermediate, AD 1,000 -1,300) human burials. One of them, a mesocephalic 35 – 40 year-old male, presents widespread osteolytic lesions, including the spine, scapulae, skull, but overall compromising the pelvis and sacrum, hypothetical site of a primary malignancy.

Bone evidence of infectious diseases, Escuela Normal historic site, Valle Viejo, Catamarca, Argentina

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The archeological salvage of a funerary structure -- a poorly preserved pit grave -- located in the premises of the Escuela Normal historic site led to the discovery of, at least, four male individuals' skeletal remains. Subsequent research included systematic excavation of the structure, culturally-associated materials' analyses, bioarcheological studies of the tomb, and a bioanthropological assessment of two of the deceased, to try to identify their sex, age, stature, cause of death, and evidence of diseases and traumas. Both studied individuals (SHEN 2, SHEN 4) exhibit bone lesions on their tibiae and on the skull in one. Given the nature of the injuries, it is possible to infer a probable infectious origin for the pathology.

Evidence of Severe Bowel Obstruction in a Chiribaya Mummy from the Osmore Valley, Peru: A Case Study of Probably Cause of Death

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Objective: This poster presents a unique case study of a pre-Inca mummy from the Osmore river valley near Ilo, Perú. Data for this study was obtained using a multi-modality approach which maximized the results and interpretability of the findings.

Materials and Methods: The mummy was examined using multiple modalities including direct physical examination, field endoscopy, field radiography, photography, and partial autopsy.

Summary of Results: The mummy was determined to be a pre-Inca individual of advanced age. His most probable cultural affiliation is late Chinchorro based on the burial style, the presence of reed matting, and associated artifacts. The diagnosis of severe bowel obstruction (SBO) was made from the examination of multi-modal data collected.

Discussion: Severe Bowel Obstruction (SBO) is a mechanical or functional obstruction of the intestines, preventing the normal transit of the products of digestion. SBO can occur at any level distal to the duodenum of the small intestine and is considered a medical emergency. There are various etiologies for SBO including neoplasms, fecal impaction, and fecaloma. SBO may present with severe abdominal pain, abdominal distension, and fecal vomiting. Untreated SBO may result in death.

Bringing Imaging into the 21st Century

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Objectives: It is the objective of this paper to discuss and describe the manner in which radiographic media collected on standard radiographic film can be converted to a digitized format, improving image quality, assuring conservation of the data as well as the potential of data base development. The paper will also compare and contrast the potentials of digital imaging alternatives.

Materials and Methods: Over 900 radiographs were taken between spring 1998 and summer 2003 of 209 of the 219 mummies recovered from the Laguna de los Condores in 1997 in northeastern Perú. A field radiographic facility was established in the remote village Leymebamba. The study was carried out using radiographic film and cassettes donated from a number of clinical facilities associated with Quinnipiac University in

Hamden, Connecticut. The constant variability of supplies, tribulations associated with wet processing and changing climatic conditions over the five-year period contributed to inconsistent image quality. In 2003, all the radiographs were reviewed by a radiologist and several reports were presented and a project was undertaken to digitize the images. Prior to digitization with a flat-bed scanner equipped with a transparency adapter, poor quality radiographs were copied in an attempt to enhance the images. Recently, the project was completed and the 1,080 images consisting of 38 gigabytes of data were finally stored on an external hard-drive.

Summary of results: The presentation considers methods to improve the quality of processed radiographs prior and post digitization.

Discussion: The advantages of digitized images, such as reduced storage and ease of distribution for interpretation will be described. In addition, the digital alternatives to using film as a recording media will be outlined.

Consistency of Food Influencing the Growth and Morphology of the Mandibular Condyle

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The objective of this study was to determine if variation in the shape and mineralization of the mandibular condyle are the result of natural adaptation in response to different functional loading demands. Eight female Kuni Kuni piglets were randomly assigned to two groups of four, receiving either a soft or hard diet. Each animal was given three separate doses of vital stains intravenously at set time-points during the study. At 8.5 months, animals were euthanized and temporomandibular joints (TMJs) were excised. Histological analysis was used to measure the amount of new bone deposition in the anterior, central, and posterior regions of the mandibular condyle. Backscatter electron (BSE) imaging was used as a semi-quantitative estimate of bone mineralization in these two diet groups. Histology revealed that the degree of new bone deposition in the hard-diet group was significantly ($n = 4$, $P < 0.001$, paired t-test) higher than that of the soft-diet group. Also, the majority (87%) of animals fed a hard-diet tended to show greater new bone deposition on the left side in comparison to the right, indicating a chewing preference for the left side. In both groups, the degree of new bone deposition was significantly ($P < 0.01$) higher in the posterior area than in other regions. BSE imaging corroborated basic histology results, with significantly ($P < 0.01$) higher mineralization levels detected in the hard-diet group. These findings indicate that diet consistency has a small but significant effect on the rate of bone deposition in the mandibular condyle.

Evidence of Anemia in Ancient Aboriginal Populations of Northern Argentina

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Pathological conditions relating to hematological nosologies include the various types of anemia, generally considered as the main etiological cause of porotic lesions on the roof of the orbits and the outer walls of the neurocranium. Cribra orbitalia and porotic

hyperostosis, also known as cribra crania, are skeletal lesions frequently associated with iron deficiency anemia. It is now considered that anemic conditions are not necessarily conditioned by an insufficient intake of iron, since the intrusion of infectious microorganisms in the organism can cause a conspicuous ferric deficit in the body as well. The aim of this research involves the evaluation of lesions caused by conditions of anemia, which are observed on the external cortical tissue of the neurocranium. Macroscopic and radiographic examination of the cranial elements has been used on this research. Thickness of the areas with porous lesions was also recorded. The skeletal sample studied includes a total of 65 individuals, relating to aboriginal populations that occupied the plains of the province of Santiago del Estero in northern Argentina, during the centuries between XII and XVI AD. Results do not indicate a significant prevalence of cranial porotic lesions in the sample studied. Archaeological and ethnohistoric sources concerning these pre-Columbian societies refer to a conspicuous use of the natural resources of the surrounding environment and a concomitant adequate nutritional intake. Therefore, the lower prevalence of porous abnormalities on the skulls studied in this research may represent cases of iron-deficiency anemia probably caused by infectious diseases and parasitism.

Elegy and Illness

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Objective: Describe the Roman medical system and the classical Elegiac genre regarding the way love was considered by the Elegiac authors.

Methods: The examples are taken from *Propertius* and *Ovid* as signs that express the role of both, doctor and medicine, before the love illness.

Results: Despite not being described in medical books, the love illness was always present in the Roman life, so that the Elegiac poems can be taken as symbols of how the Roman society regarded love in opposition to the institution of marriage, pointing out that love would stand for a lack of control, a disorder that originates illnesses, while marriage would be a stronghold of the well being: a establishment of order and, consequently, health, meeting the demands of Roman morality.

Discussion: In the second century before Christ, Roman medicine had a history based on Etruscan and Greek foundations that was improved by Latin healers. Healing methods were mostly based on nutrition, religion, exercising, superstitions, massages, herbs, music and singing. Some healers would treat wounds. However, when their methods were not efficient enough, they would be derogatively called *carnifex* (butcher). Notwithstanding, there was a disease which was very common in those days but not described in the medical books: love, an illness that was not considered grave, but had serious effects to the one in love. Since medical books of that time ignored the love sickness, other genres have to be examined for that matter. The Roman Elegiac poems are some of the texts that were kept ever since the second century B.C., being tokens that discuss love as an illness. *Passio*, suffering, is a word that originates both “passion” and “patient”, which can perfectly represent the Elegy, a poetic genre that also prescribes some medicines to the incurable disease of love.

Phytonematodes' Eggs found in human coprolites from Aspero, Peru

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The archeological site of Aspero (Late Archaic, 3,000 – 1,800 BC) is located on the right bank of the Supe river, 500 meters away from the Pacific Ocean. The local environment consists of sandy hills, wetlands, crop fields, and beaches. Pre-Columbian Aspero coprolites collected by the Caral-Supe/INC Special Archaeological Project (PEACS) were rehydrated with an aqueous solution of 0.5% trisodium phosphate. Sieves were used to separate micro from macro remains. A portion of micro remains were examined using simple and Willis' concentration methods, with a Carl Zeiss phase contrast microscope and a micrometric eyepiece. Two coprolites revealed eggs whose shape and dimensions (100 x 40 microns average) match those of plant nematodes. Today, it is not uncommon to find plant nematode eggs in human feces, which can be confused with hookworm eggs. However, careful measurement and morphological observation avoid misidentification. Not being a human parasite, few researchers record plant nematode eggs in the literature. Its presence in pre-Columbian Aspero indicates that this parasite might have been affecting local crops.

Infant Mortality Due to Infectious Disease in Ancient Times: The case of "Cerro Colorado Ciénaga de Abajo" (Catamarca, Argentina)

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The aim of this paper is to present the analysis carried out on skeletal remains found in La Ciénaga, Belén Department (Catamarca - Argentina). The archeological excavation inside the room 36 of the site named "Cerro Colorado de la Ciénaga de Abajo", that belongs to the Regional Developments Period in the Argentinian Northwest (1100-1450 AD), uncovered two stone inhumation structures (cists) each one of them containing a burial urn in its interior. The removal of the first structure sediments to a depth of 1.10m, revealed an urn containing the bones of a 2 year old infant. The second structure, was also systematically excavated to 1.09m, where there was discovered another urn containing the skeletons of two children of 18 and 6 months respectively. In particular, the last one, despite the deterioration of the remains and the young age at death of the individual, shows different diagnosable pathological conditions. There has been observed signs of nonspecific metabolic stress like porotic hyperostosis, evidence of periostitis in proximal humerus and a noteworthy morphometric and morphoscopic difference between both femurs (left and right). Possible causal explanations were evaluated through a process of differential diagnosis on alternatives. We conclude that bone lesions are different manifestations of a severe infection (osteomyelitis) that in infants usually presents multiple foci and that in this case developed severe complications, which most likely caused the death of the individual at such a young age.

Biological study of Francisco Pizarro's remains and his likely cause of death

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The authenticity of Spanish conqueror Francisco Pizarro's remains has been contested for long. This study, carried out since December 2006, has settled the issue through an interdisciplinary approach that dispelled all possible problems that had hindered previous research. Therefore, physical anthropology, biology, entomology, physical and chemical analyses, and forensic methods concurred to allow a 90% positive identification, an outstanding achievement considering the wanderings of the body over the last 500 years. Ongoing mtDNA analyses are expected to support this paper's claim.

Genetic Diversity and Divergence in a Contemporary Chachapoya Population from Amazonas – Peru: aSTRS, Y-STRS and mtDNA Evidence

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Introduction

This work aims at understanding cultural processes within the Chachapoya territory through a study that incorporates genetic information. Archaeological, ethnohistorical, and linguistic information (e.g. Church and von Hagen, 2008; Cieza de León, 1973[1553]; Espinoza 1967; Taylor 2000) gave us some clues to propose that the genetic patterns in the modern Chachapoya could be distinctive, despite the admixture and acculturation experienced by the populations within this region after the Inca conquest. We examined the genetic diversity within this population, and explored genetic distances between the Chachapoya and other native populations either in the Andean or Amazonian group.

Subjects and Methods

The present study uses autosomal STR (15 loci), Y-chromosome STR (17-locus haplotypes), and mtDNA sequence (16024 – 16385 bp) data from 29 modern Chachapoya individuals. The sampled individuals had at least one surname of Chachapoya origin and had the family birthplace within the ancient Chachapoya territory (samples taken in towns Leymebamba and Chachapoyas, Amazonas). For the other Peruvian and South American populations data from published sources was included (Batista et al., 1993; Kolman et al., 1995; Bonato and Salzano, 1997; Rickards et al., 1999; Tarazona-Santos et al., 2001; Fuselli et al., 2003; Bert et al., 2004, Lewis et al., 2004; Moraga et al., 2004; Cabana et al., 2006, Lewis et al., 2007). DNA extraction, amplification and data analyses were carried out following standard protocols and according to suppliers' recommendations. The genetic distances were summarized with F_{ST} -values (estimated using Arlequin 3.1; Excoffier et al., 2006) and visualized with unrooted NJ-trees (MEGA version 4; Tamura et al., 2007).

Results

1) The genetic distances based on paternal Y-chromosome analysis show relatively well defined groups: Andean (brown), and Amazonian (green). The Chachapoya does not belong to either group, but are rather distant from all other populations. 2) The mitochondrial data shows high diversity among the Chachapoya ($H = 0.99$). All individuals analyzed belonged to one of the Native American mtDNA haplogroups, with haplogroup D predominating (28%), and followed by haplogroups A, B, and C (24% each). As with the Y-chromosomal data, mtDNA do not group the Chachapoya in either of the two groups, the Andean (brown) or Amazonian (green). Based on this data, the Chachapoya are as well

quite distant from most other populations. Furthermore, the mismatch distribution of the Chachapoya is unimodal, and as such in contrast with the bimodal or multimodal graphs from the other groups (e.g. Ancash: Andean, Wai wai: Amazonian).

Conclusions

- 1) The Y-chromosome and mtDNA data demonstrate that the Chachapoya is a group genetically different from the central Andean communities despite some similarities found in the genetic diversity and divergence patterns.
- 2) The uniqueness of the Chachapoya in the levels and nature of genetic diversity suggests that the Chachapoya has had a distinctive demographic history compared to many other Native American populations. This could also be partly explained by genetic heterogeneity within the Chachapoya territory during pre-Inca times.
- 3) The basal position of the Chachapoya population in both the Y-STR and mtDNA trees could suggest an early origin for this enigmatic people and demands closer multidisciplinary study.

* This is ongoing research that includes a larger sample size of the modern Chachapoya population. This will contribute to test our previous hypothesis and answer other questions regarding the population history of the Amazonas region. This data is essential for many purposes such as providing vital background information for DNA-based forensics in Peru and for comparisons with ancient DNA studies.

Diet and Health among pre-Hispanic Chiribaya dogs from Ilo, Peru

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The Chiribaya dog is a llama herder, as identified from bioarcheological studies performed on lower Ilo valley burial sites (Late Intermediate period; AD 900 – 1476), Southern coast of Peru. While all dog tombs were individual, some of them included fabrics over the bodies and other offerings. This treatment acknowledged the dogs' role in llama and alpaca herding, a leading economic activity among the Chiribaya. This paper focuses on the parasites recovered from dog and alpaca coprolites from Chiribaya contexts, and compares them with modern Highland Moquegua places in which alpaca herding is still an important economic activity, since the Spanish rule eradicated camelid herding in the low Ilo valley.

The results from this study should contribute to an improvement in our understanding of the adaptability and sustainability of living systems in which parasitoses' prevalence among the species involved in herding did not imply zoonoses or diseases, but rather adaptation, cohabitation, interdependence, symbiosis, and coexistence. Since parasites have always been present in the herding systems, it is expected that this study will add to other studies that focus on understanding the possible survival of these systems over time. The fact that these systems have not collapsed may be explained by the parasite adaptability and host – parasite – environment cohabitation, particularly among dogs and camelids sharing a herding system that has endured over the centuries up to the present.

Considering this viewpoint, it is expected that our results will help to explain the continuity of isolated cultural systems that, though pristine and technologically non-developed, have succeeded in getting solutions adjusted to their many constraints; and in which morbidity, mortality and productive yield were, apparently, not as important as reaching an equilibrium.

Dental Paleopathology of the Mummies from Laguna de los Cóndores

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During the years 1998 to 2002, lateral and anterior-posterior images were recorded on radiographic film for 212 of the 219 Chachapoya mummies rescued from Laguna de los Condores in 1997. In the Spring of 2011 these radiographs were digitized and were evaluated. Digitizing had improved the quality of the images and consequently aided this study.

Materials and methods: The digitized data was downloaded in several CDs and sent to two specialists. The aim was to estimate the presence of dental pathologies, including caries and periapical lesions, as well as a review of wear and the assessment of periodontal status. As there are no standardized methods to evaluate dental pathologies from radiographs very simple assessment schemes were agreed upon by both reviewers. Caries and periapical lesions were recorded by tooth regardless of surface or extent. Overall wear was divided into three stages: clearly in enamel, clearly through to dentin, and clearly through to pulp. Horizontal bone loss was assessed from 1 to 3, accordingly to the cervical third, middle third and apical third. The number of missing teeth was recorded.

Conclusion: Out of the 212 radiographed mummies, 16 were excluded from this study because in 12 cases there were no images of the skull and in 4 cases the mandibles were missing. Hence the data was collected from 196 mummies. Two simple figures express dental health of these 196 Chachapoya mummies from Laguna de los Condores. Altogether 42.5% (n=84) had full teeth. One individual with developing permanent dentition had caries lesions. As wear should be visually recorded from actual remains, and the contrast of the images was not always ideal causing twisted views of the thickness of the enamel, only stages 2 and 3 of wear were recorded. 39 individuals (19.9%) showed signs of heavy attrition. Horizontal and vertical bone loss with values 2-3 was found in 46 individuals, this is 23.5%, meaning that almost half or more of the bony support of some teeth had been lost.

Discussion: The digitized form of lateral and anterior-posterior images were easily focused and magnified on teeth and the view was still extremely sharp. Whenever the projection managed to show individual teeth, diagnosing was easy. Nevertheless, most often there was superimposition of both sides of maxilla and mandible. This study should be considered as a directional tool about the prevalence of dental paleopathologies of Chachapoya mummies from Laguna de los Condores. Most likely all of the pathologies were underestimated. Still this study provides insights to the way of life of these mummies, as prevalence of caries and amount of attrition can be informative about diet (Hillson, 1996). Such high prevalence of caries is an indicator of a diet high in carbohydrates, which in turn is a good reference about agricultural activities (Larsen, 1999). Heavy horizontal bone loss, especially recorded in the region of premolars and molars is indicative of the use of coca (Indriati and Buikstra, 2001).

This study will be supplemented by x-rays with more targeted digital images. The device to be used is a scanner, Dental VistaScan Mini Plus from Durr, Germany with Romexis software from Planmeca, Finland. This portable scanner enables quick and easy x-raying with different sized periapical and occlusal films.

Estimation of Age-at-Death from Teeth of Chachapoya Mummies with Non-Completed Dental Development

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Centro Mallqui Amazonas houses 219 Chachapoya mummies rescued from the mausoleums of Laguna de los Condores in 1997. Most of the mummies are wrapped in textiles; this implies that the analysis of teeth can only be done with x-rays. At this point the study was confined to estimate age-at-death of the individuals whose dental development was not complete. The initial radiographic evaluation involved two sets of lateral and anterior-posterior radiographs of the mummy bundles. This set of x-rays available at Centro Mallqui Amazonas was reviewed in January 2011 and is the basis for this work. According to these lateral and anterior-posterior radiographs, 52 individuals showed ongoing dental development at the time of death. Supplemental x-rays were taken from these mummies using a digital dental sensor, Prosensor, with software Romexis, Planmeca Finland. The portable x-ray machine Soyee SY-31-100P in Centro Mallqui Amazonas is a powerful device used with a digital sensor. The used values were kVp 70, mA 25, exposure time 0.07s and distance 40cm. The major influence of the values in achieving proper images was the source-to-image distance. Due to the wrapping of the mummies, the radiographic sensor was placed outside the skull instead of inside the mouth. Depending on the stage of development several x-rays were taken of each of the 52 mummies. In three mummies no supplemental images were required and the evaluation was based on lateral and anterior-posterior images. The estimation was made using the Atlas of Human Tooth Development and Eruption Chart (AlQahtani, SJ, 2009). In this chart the diagrams illustrate each year in its midpoint. Teeth under development are widely used when estimating age-at-death from skeletal remains (White, 2005). Using the lateral, anterior-posterior and digital images age-at-death was evaluated for 52 mummies. When all the radiographic findings fit at a one age diagram, that age is the estimation. If the findings fit in two consecutive diagrams estimation was between these two ages.

Discussion: The used portable digital device was easy and quick to use. The sensor was small enough to be used outside the skull and clear and sharp sets of images were often produced. Due to the extra oral positioning of the sensor better images were available for mandibular teeth while there was often too much over-imposition in the maxillary images.

Paleopathology from Huari

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Our project, which began in 1997, started applying an in-situ bioarcheological approach to Marcajirca's skeletal remains in 2007. This Huari site (AD 1,020 – 1,640), comprises 36 *chullpas* (mausolea) and over 30 burial caves, out of which 9 and 7 respectively, have been excavated rendering 258 individuals. C14 dating shows both burial types were used over overlapping extended periods of two or more centuries. Intrusive post-contact tombs stress the site's ancestral value for the natives who endured the 17th century Spanish 'reducciones.' On the other hand, many skulls show signs of violence, and of remodeling of three kinds: annular erect, annular oblique, and bilobular (some with scraping and straight-cutting surviving trepanation cases). Although all the caves are

expected to be screened to determine if social status prescribed the burial type, secondary burials have already been demonstrated among some originally chullpa-buried individuals whose long bones were collected, tied up, and then moved to the caves.

***Mycobacterium tuberculosis* ancient DNA detection in human remains from Pretos Novos cemetery from 18th – 19th century, Rio de Janeiro, Brazil ***Winner**

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It is known that the tuberculosis (TB) existed in New World since pre-Colombian times. However, this disease becomes more important after European arrival in the New World. Ten million Africans were brought to the Americas during the slave trade, and more than three million were brought to Brazil. The Pretos Novos cemetery was founded in Rio de Janeiro city to support the increasing number of African slaves that died in the market, before being sold, because of the inhuman conditions that they were exposed to during the journey to Brazil, or because of the high susceptibility to diseases spreading in the city. The aim of this study was to perform a paleogenetic analysis of human remains recovered from the archaeological site Pretos Novos cemetery, in order to detect the presence of TB infection by *Mycobacterium tuberculosis* complex (MTC) ancient DNA (aDNA) analysis, and to verify the human ancestry of the population buried, through mitochondrial DNA (mtDNA) analysis. The characteristics of the bones indicate that individuals were submitted to an intentional cremation process, as related by historic documents and bioarchaeological analysis. Nevertheless, it was possible to verify the presence of TB infection by aDNA hybridization with IS6110 and IS1081 MTC targets, in 4/16 individuals (25%) and 3/16 individuals (19%), respectively. The analysis of human mtDNA showed African haplotypes in 3/16 individuals (19%). We here discuss the contribution of European settlers and African slaves to the TB epidemic in the colonial period, the aDNA recovery from cremated bones. We also discuss the contribution of particular African mtDNA haplotypes to the current Brazilian population.

Functional limitations due to fractures and social support among pre-colonial coastal groups from Brazil

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The comprehension of the functional limitations caused by acute trauma constitutes one of the few tools of paleopathology to discuss social support among pre-colonial populations. Brazilian coastal series from shell mound builders and fisher-hunter-gatherers sites, composed of 215 adults from both sexes, was examined for accidental fractures, presenting a frequency of 22.7%. Among these injured individuals, some suffered severe trauma, such as femur fractures (10.2%) and nonunion fractures (18.9%), which resulted in significant impairments. A prolonged period of convalescence and limited mobility in the first case, and loss of limb strength, making it impossible to carry out numerous activities, in the second case, suggest the existence of strong social support to compensate the morbidity

resulting from injury.

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Presence of Leishmaniasis in the Northern Coast during the Early Intermediate Period.

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One of the best evidences of pre-Columbian mucocutaneous leishmaniasis (MCL), an endemic Andean disease, is Moche iconography (Early Intermediate Period). An effort was made to discriminate cases depicted within the extensive Larco Herrera Museum's Moche pottery collection. Therefore, representations of facial lesions were grouped as: leishmaniasis-like, non-leishmaniasis-like, and punitive mutilation-like. It was found that most cases probably represent MCL, due to the significant facial destruction represented showing nose and upper-lip destruction.

A Chilean soldier from San Juan Battle, War of the Pacific: Forensic Science applied to History

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In March 1998, a naturally mummified body was unearthed at a Police School south of Lima. A fully dressed Chilean soldier had been carefully buried below the desert's surface. His paraphernalia allowed linking his death to San Juan's battle (January 13, 1881), in which Chilean troops broke Peruvian defending lines, causing about 10,000 casualties. Anthropological analyses revealed the soldier was a 35 – 40 year-old, ± 1.66 m tall, Caucasian male. Skull's fragments x-raying showed shrapnel, which once put together, revealed a left side yawning-off keyhole frontal fracture, associated with fissures and another triangular hole to the left. The pattern suggests death occurred after a tangential shot whose specific characteristics such as trajectory, position of the victimizer, as well as the most likely possible weapon used, could be reconstructed; all of which are consistent with historical descriptions of this battle.

Occupational Diseases of a Coolie Chinese Worker, Hacienda Santa Barbara, Cañete, Nineteenth Century

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Between 1849 and 1874 there was a mass migration of Chinese coolies to Peru, mainly to work on agricultural production of cotton and sugarcane in farms located along Peruvian coast. One burial of a nineteenth-century Chinese immigrant, found in the place known as Huaca de los Chinos, in Hacienda Santa Barbara, will reveal the health conditions of the workers on the farms.

The osteological analysis reveals the worker suffered permanent diseases. The distribution and severity of pathologies, degenerative joint diseases, in addition to spinal arthritis and robust muscle attachment, provides information about physical stress caused by agricultural harsh work, leading to joint disorders, dysfunctional members, trauma and chronic lung disease.

The Acauã Brazilian mummy is an Aiyana clan descendant

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Molecular genetic studies of Native American populations have utilized the maternally inherited mitochondrial DNA (mtDNA) to understand the peopling of the Americas. Nine mtDNA haplogroups, A2, B2, C1, C4c, D1, D2a, D3, D4h3, X2a, are almost exclusively present in Native American populations and classified as autochthonous. In 2001, Prof. Bryan Sykes in the work “The seven daughters of Eve”, introduced the concept of giving names and the term “clan” to ancestral mtDNA haplogroups. Therefore, Aiyana, Ina, Chochmingwu, and Djigonasee clans that correspond to haplogroups A-D, respectively, are found all over the New World and are also frequent in Asia, supporting the Asian origin of Amerindians populations. The Acauã mummy is a juvenile mummy about twelve years of age dating from 3,500 years ago that was found in the Gruta do Gentio II cave, Unaí municipality, Minas Gerais state, Brazil. This mummy belongs to Una ceramist tradition and was buried with evidence of funeral rites and embalming processes. The aim of this study was to perform a paleogenetic analysis of human remains recovered from the Acauã mummy in order to verify their human ancestry through mtDNA analysis. Acauã mummy is part of IAB-Institute of Brazilian Archaeology collection (Instituto de Arqueologia Brasileira), where biological samples of teeth and bones were collected. The ancient DNA study was conducted though paleogenetic conditions. The analysis of human mtDNA was performed with 4 different samples and diverse molecular targets that overlapping the segment 16034-16498 of the HVRI region were applied. The sequence analysis results showed that the Acauã mummy belongs to the Amerindian mtDNA haplotype A2 or Aiyana mother clan, one of the Native American founder lineages. The study generated new data of pre-Columbian human genetic information.

A Case of Craniosynostosis of the Sagittal Suture in a Subadult of the Furna do Negro, Jataúba District, Pernambuco, Brazil

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This paper presents craniometric and cranioscopic data of a subadult 9 year old, probable male, recovered from the Furna do Negro prehistoric site, in the district of Jataúba, Pernambuco, Brazil. The archaeological record was unsystematic as it had been dug by the local community and the bones were collected. Seven individuals were transferred to the Center for Archaeological Studies (NEA), Pernambuco Federal University for future studies and archaeological research in this region. The skull shows craniosynostosis of the sagittal suture. The craniosynostosis is a pathological condition that can result in premature synostosis of cranial sutures. The sagittal synostosis is the most common phenotype and represents 40 to 50% of non-syndromic cases. It usually occurs as an isolated condition in 1

to 2 cases from 2000 to 2500 live births in the world. Typically this condition results in a deformity known as scaphocephaly, due to non-lateral growth of the neurocranium. It is debatable whether this condition leads to increased intracranial pressure and, in this particular case, did not result in the death of the individual. This skull does not present scaphocephaly, which could come to be characteristic in adulthood.

Analysis of Oral Health Indicators and Mechanical Stress in an Individual from the Salar of Pastos Grandes (Puna de Salta, Argentina)

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The Salar of Pastos Grandes is located in the Puna of Salta (Argentina) at an average altitude over 4000 meters. This is an extremely risky environment characterized by unpredictable droughts, uneven distribution of resources in space and a low diversity of plants and animals. This paper presents the results of analysis conducted on the bioarchaeological remains of an individual from that area. This male individual was radiocarbon dated at 3738 ± 46 years BP. This study considered the analysis of indicators of oral health (caries, abscesses and antemortem loss) and mechanical stress (degenerative and traumatic injury, and tooth wear).

The results indicate the loss of two teeth by antemortem abscess and the absence of caries. There was also a high degree of dental wear and rounded horizontal direction. The degenerative lesion analysis indicates that the most affected bones were the lumbar vertebrae and the appendicular skeleton. The analysis of these traumatic injuries allowed us to make two assumptions. On one hand, one of the recorded changes (dislocation of second phalanx of the hand) would be associated with high levels of physical demand which involves living in a context of high risk; on the other hand, cutting and grinding marks would be the result of a situation of interpersonal violence.

Following these results we can argue that while the estimated age for the individual corresponds to a young adult, high levels of stress would have been recurrent throughout his life to so affect the skeleton and teeth. This would be related to the socio-ecological pressures of the early Late Holocene in this region.

An Archaeological Population Study of a Sample from Argentine Puna Through Bioarchaeological Indicators and Isotope Markers (Doncellas Village, Jujuy, Argentina)

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Traditionally, the study of the archaeological record from the subregion Puna of Jujuy argues that during the Late Period or Regional Development (1000 AD-1450 AD), people who lived at the village Doncellas or Aguas Calientes de Rachaite (Department of Cochinoca, Jujuy, Argentina) had a primarily agricultural economy. In this study we argue that the economy of these groups also included an important component of grazing and hunting.

We present here the results obtained from the bioarchaeologist study of a set of human remains from the site mentioned. The indicators considered were: tooth

decay, abscesses, dental enamel hypoplasia, porotic hyperostosis and cribra orbitalia. The study shows a low prevalence of the indicators analyzed. These results are consistent with expected trends for populations known generically as farming. These results were observed also in archaeological sites from other areas around the Argentinian Northwest during the same period of time.

The information obtained from our analysis allowed us to hypothesize that maize would not have been the main component in the diet of the individuals represented in the sample. Furthermore, these results are reinforced by the research being conducted through the study of stable isotopes. The information generated from the analysis of carbon isotope ratios ($\delta^{13}C$) in both organic and inorganic fraction of bone, are associated so far with a diet characterized by a pattern photosynthetic resources (C3) which holds different maize (C4). These results would support our hypothesis.

Reconstructing a Health model for pre-Columbian Ecuador: An Interdisciplinary Approach

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Through a proposed dialogue between scientists and informed natives, an attempt is being made to reconstruct Ecuador's ancestral health knowledge, particularly focusing on their handling of infectious diseases. Some sources to achieve this goal include gathering information from historical and bibliographic sources, analyzing ceramic art, understanding the domestication of food and medicinal plants, and contextualizing ceremonial centers' architecture as communication means with guardian spirits. Some examples of native therapeutics include the use of *Artemisia annua* and *Cinchona pubescence* for treating malaria. Other sources show that bartenellosis (Peruvian wart), leishmaniasis, tuberculosis (including Pott's disease), leprosy, and treponematoses (yaws and syphilis), among others, were all known in pre-Columbian times. Besides historical and ceramics evidence, human skeletal remains are expected to be studied, as well as their aDNA. It is expected that through the balanced integration of all information gathered the integration of pre-Columbian evidence of disease, along with health knowledge from current shamans, a native model of ancestral health could be reconstructed and integrated into the health policies of the republic, as mandated by the Ecuadorian constitution.

Preliminary diagnosis of cancer in a Paracas Necrópolis funerary context

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More than 80 years after the excavations carried out by Julio C. Tello and his research team on the Paracas Peninsula, despite the worldwide fame of this culture there have been few specialized studies of the human remains.

Mummy bundle 16 was excavated in November 1927 at the extreme eastern end of the Necropolis of Wari Kayan. In 1937, at the suggestion of Nelson Rockefeller, Tello sent this bundle together with three others to New York, to be studied and exhibited there to build international support for scientific archaeology in Peru. At the request of Alfred Kidder Jr., bundle 16, the largest of the group, was sent to Harvard, Tello's Alma Mater, where it was

studied in 1938.

The bundle was unwrapped according to the procedures developed by Tello. The objects discovered within include artifacts similar to those found in better known studies like that of burial WK 310 (Tello 1959; Paul 1990), considered contemporary with phase Nasca 1. As part of the initial phase of preparing the body and on top of an initial group of embroidered textile offerings, the individual was dressed with a red *llautu* headband and a red poncho of cotton and camelid yarns plied together, a style not known from other funerary contexts at the Paracas site.

On macroscopic analysis of the skeleton, a male 40 to 55 years old demonstrated a series of lesions on the cranium, affecting the sphenoid, temporal, ethmoid and vomer. Principally destructive in nature, the lesions have sharp and irregular edges, showing greater destruction on the interior. A light reaction was also observed on the external surfaces of the cranial base, which includes bone spicules perpendicular to the temporal surfaces. Similar lesions were not observed in other parts of the skeleton. The macroscopic characteristics of these lesions suggest metastatic cancer. This diagnosis is preliminary, as tomography and histological studies are planned.

Congenital Tarsal Synostosis in a Modern Skeletal Collection

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Tarsal synostotic defects are due to the lack of segmentation and mesenchymal differentiation during the embryonic development and may involve bone, cartilage, and/or fibrous tissue. These malformations are one of the most common causes of painful rigid flatfoot, with an estimated 0.3 - 0.6% incidence. The most frequently observed variety is the heel-scaphoid synostosis, bilateral in half of the cases. This paper presents a case from Dr. Romulo Lambre's Collection, which comprises contemporary individuals from La Plata's Municipal Cemetery, and is curated at the local Medical Sciences' School (La Plata National University, Argentina). Pathological analyses on this 62 year-old male, according to his death certificate, shows bilateral osseous bridges joining the calcanei with the navicular bones completely. The lack of osteophytes and the presence of definite well-rounded margins of the anomalies support the diagnosis of a developmental anomaly, and deny a degenerative origin. Moreover, there was neither evidence of surgical attempts to resect the unions, nor presence of any other congenital synostoses in the rest of the skeleton. It is believed that the importance of this work lies in the heuristic value of the material for different disciplines, such as medicine and anthropology.

Musculoskeletal stress markers in three indigenous historical series from Brazil

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The ability of the skeletal system to respond to a constant mechanical workload can be used as a general indicator of activity patterns. The present study is part of a greater project devoted to investigating various markers of occupational stress in different skeletal series from Brazil, including prehistoric and historic ones. The study began with the analysis of

skeletal remains from two small historic collections: the 1882 anthropological collection and the Rondon Collection. The first was prepared at the end of 19th century for a great anthropological exhibition at Museu Nacional, in Rio de Janeiro city and comprises human remains of indigenous groups from southeast and north of Brazil; Rondon collection resulted from the expeditions of Marechal Candido Rondon, to the North and Northwest of Brazil. Through this activity, many anthropological items were collected by the members of expeditions, including human remains. Another historic collection is under investigation now. The Guajajara series, collected in the middle of 20th century by Pedro de Lima, a researcher at Museu Nacional, which comprises individuals from two indigenous cemeteries in Maranhão State. In this study, we present the results for musculoskeletal stress markers for these collections and compare then with the result of previous data for prehistoric and historic people. The MSM analysis was performed in long bones from the appendicular skeleton. Only adults or late adolescents were selected for the study. The results indicate a general pattern of slight to moderate marker expressions, with some exceptions. Although it could be an indication of absence of vigorous physical demands, the historical context of Guajajara series and other health conditions previously observed points out that this interpretation must be considered with safeguard.

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A New Aetiology of Dental Chipping: a Peruvian clinical case

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Our purpose is to call the attention of the scientific community to an evident and usual aetiology of tooth chipping in a modern Peruvian population, which due to a lack of dental reports and descriptions in clinical practice, seems to be unnoticed by both dentists and dental anthropologists. The loss of small particles of enamel characterized this kind of dental injury in archaeological specimens, providing valuable information about habits, customs and social organization in prehispanic populations. This last observation is also applicable to clinical studies, as this study is going to show. The clinical sample consisted of 200 mine operators, all of them young adult males between 20 and 40 years old, being one third of them (n=40) affected by this type of tooth chipping. We describe and discuss the clinical features of this kind of dental condition, identifying three stages of development and severity of the injury, as a clear and recognizable pattern of tooth chipping. Based on the clinical evidence from Peru (CP case), it is demonstrated that this distinctive pattern of tooth chipping results from the use of teeth as a tool to open bottles, habit considered by some young men as an act of courage, a feat or even a rite of passage, generating a specific dental injury of triangular shape with its buccal apex extending towards the buccal gingival, and another apex projecting towards the occlusal face of the buccal cusp of the affected tooth, involving first the enamel and then the dentin of the tooth, generating a profound groove and leading finally to the loss of the tooth. It is clear, that the consequences of this cultural habit are harmful to teeth and oral health of the individual.

Intentional dental modification: ethnographic evidence from Africa

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Since ancient times humans use their bodies with the intention of protection, ornamentation or as individual or group identity marks. The practice of permanent modifications can be traced back when bones and teeth are preserved as well as when represented in artefacts and other ethnographic objects. This is the case of intentional dental modification. The aims of this presentation are to report and to learn about these identity marks presented in masks from Angola, housed at the University of Coimbra. The Zombo and Yombe ritual masks show intentional removal of the incisors while alteration of the contours of the dental crown can be seen in the Ngangela, Mbunda, Ndunga do Kongo and Cihongo and Pwo, both Cokwe. These masks were used during male rituals. This study is also based on ethnographic and iconographic accounts made during anthropological missions and expeditions to Africa. Thus, it is analyzed how the aesthetics and beliefs explain the ritual and social dynamics of dental modifications among different African groups. Patterns and prevalence of dental modification and the possible pathological consequence, including gingivitis, of these practices will be discussed. It is known that dental modification crossed the Atlantic during slavery, thus this study may help in the interpretation of these types of findings in the Americas.

Changing heads: intentional cranial modification in Pre-Columbian Jamaica

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Abstract: Intentional cranial modification has been practised by populations in the prehistoric as well as the historic periods in a wide range of geographical localities. There are different explanations for this cultural practice – for example, religion, status, distinguishing between groups, and aesthetics, among others - but all agree that it carries cultural significance within the population. This practice was shown by the population in their artifacts, described and illustrated in ethnohistorical accounts, and permanently preserved in human skulls. Thus, they became of paleopathological and/or biocultural interest. The aim of this paper is to discuss the cranial modification reported for the Tainos of Jamaica. The skulls from this pre-Columbian population were permanently modified and have been reported in anthropological/archaeological studies since the 19th century. Since Tainos were the inhabitants of Jamaica at the time of European contact, there are Spanish accounts that referred to the population having broad heads. The osteological evidence shows that both men and women had the shape of their heads changed. Frontal flattening and parietal expansion, also designated as “parallelo-fronto-occipital” modification, is the most common type represented. Moreover, the results of this analysis will be compared with data available for the Tainos from neighbouring islands.

Revisiting Furna do Estrago archaeological site, state of Pernambuco, Brazil

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Furna do Estrago archaeological site is a rock shelter occupied by prehistoric hunters since the Holocene, 11,000 years BP to 1,000 BP. It is located in Brazilian northeastern upland forests, a mesic enclave, located in a semiarid region representing a true "oasis" for having higher altitude and humidity. This site had been previously studied by our team but was re-examined in an effort to increase previously undetermined findings.

Were re-analyzed 112 samples of coprolites, 16 of humans, 65 of Felidae, three of Cervidae, two of Tayassuidae, four of Caviidae, one of Myrmecophagidae, one of Echimiidae, plus three of Bovidae from surface and 17 unidentified coprolites. The coprolites were re-hydrated in Na₃PO₄ for 72 hours, spontaneously sedimented and analyzed in microscope.

We highlight the finding of new parasites in human coprolites such as eggs suspected to be *Hymenolepis* sp., third record of this cestode in Brazil and *Acanthocephala* eggs, second record in human coprolites in Brazil. These findings may represent the possibility of zoonotic diseases in these populations since natural hosts of this parasite are animals. Eggs of *Parapharyngodon* sp., a parasite from reptiles, were found in human coprolites as had already occurred in archaeological area of São Raimundo Nonato. This parasite appears in human coprolites when whole uncooked lizards are eaten and may be related with famine periods, as evidenced in paleopathological studies in skeletons.

In Felidae, *Spirometra* sp. was found in 57% of the samples, more samples than in former analysis. Other recent results may represent novel significant findings such as the possible presence of *Dyphillobothrium* sp. and *Echinostoma* sp., both primary in these hosts in coprolites.

These results show the importance of preserving as much as possible of coprolite samples in case there is a need for further analysis to possibly extend the identifications of unknown parasites.

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Dental Modification as an Evidence of African Identity in Brazil

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Intentional dental modification was a regular cultural practice in Africa. With the African diaspora the practice spread to other continents. It was described in Brazil, as well as in other American countries as the United States, where such a practice had not been described before. Because of that, some papers propose a direct association between the finding of intentional dental modifications in archaeological contexts and the presence of African individuals in those sites. In this poster the authors discuss such archaeological findings and their relationship with the presence African individuals in two archaeological cemeteries: Pretos Novos, the cemetery of the slaves market from Rio de Janeiro (Rio de Janeiro State), and the first Cathedral of Brazil, the Sé Primacial from Salvador city (Bahia State).

Thirteen modified teeth from Pretos Novos (comingled remains), and 122 modified teeth from Sé de Salvador (comingled remains and primary burials), were described among hundreds of teeth analyzed. Thirteen different modified dental designs were classified, most of them affecting the upper central incisors; ten different kinds of modified dental arches were also described. In most of the teeth the border was chipped and then filled and polished, to get the final design; which is consistent with the African techniques.

Different dental designs in both sites were suggestive of different origins of the individuals, which was also consistent with the historical documents about slave trade to Brazil. Although in the two sites most of the dental modifications were consistent with the African designs and techniques, it is necessary to remember that the practice of dental modifications persisted in some parts of Brazil up to the middle of the 20th century, adopted by some native Indian groups. Only one design and a more simple technique seem to distinguish the Brazilian modifications from the African one.

Exploration of bone mineral density and osteopenia in ancient populations of Southern Patagonia

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Until now, no specific evidence of metabolic health in past human populations from Southern Patagonia is available. A useful tool to generate this kind of information is the analysis of bone mineral density (BMD). Considering this, the aim of this paper is to explore the BMD of human remains of individuals from Southern Patagonia and their possible relationship with the age and the impact of Native-European contact. The BMD values of femoral neck and Ward's triangle of 15 adult human skeletons were studied by Dual energy X-ray absorptiometry (DEXA), at the Instituto Radiológico Mar del Plata. The results showed a reduction of BMD higher than 25% in women above 30-years-old in relation to the younger women group, which could be connected to maternity and to nutritionally insufficient diet. On the contrary, men did not show BMD reductions associated with age. In both cases, BMD differences were not observed among individuals from pre and post contact periods.

Analysis of Starch Granules to Evaluate the Importance of Control Measures to Handle Coprolites

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Coprolites have always been a source of information on livelihoods, food, health and even about the prehistoric pharmacopeia. However for many years, this object of study has been neglected, either due to lack of knowledge about the possibilities of information, or for lack of care with the proper handling of the material.

With the expansion of research during the twenty-first century, archaeologists and paleontologists have increasingly explored the potential of archaeological sites, including

the collection and analysis of material to geomorphological studies of botanical, wildlife and ecology of sites.

One of the problems of these studies is contamination of the coprolites, because they are often found free in the soil or even by exposure to the soil over time during which the body decomposes, generating a challenge and new measures at the time of interpretation of the data provided.

As an example of the influence of all procedures that involve the analysis directly on the coprolites, in this paper, we show how often we found starch granules in microscopic analysis, before and after the decontamination of laboratory paleoparasitology.

The laboratory was decontaminated in 2009, measures were taken that were simple and quite effective, surgical gloves that were used for manipulation of coprolites were exchanged for silicone/vinyl gloves without talc. The whole lab went through a process of cleaning countertops, floors and containers.

Analyses that took place after the decontamination began to show a much lower number of starch granules in their microscopic analysis. The starch, which by then was commonly found in virtually all samples, has become scarce.

Thus, the presence of starch granules acts as a sentinel indicating the importance of human intervention in analysis and interpretation of results. This work also shows how important it is to create protocols that are applied during the collection and handling of coprolites.

A Holoprosencephaly (cyclopia) case from the Nasca culture, Peru

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Holoprosencephaly, an umbrella-term for encephalic malformations, is caused by the lack of division in the embryo's forebrain. Depending on the degree of differentiation reached by the forebrain, these conditions can range from mild to severe. Mild lobar forms are common and include, among others, cleft palate and/or cleft lip cases. Severe lobar forms are rare and incompatible with life. This paper reports a non-lobar holoprosencephaly case from a Palpa cemetery (Middle Nasca Period, AD 325 – 440) in the southern Peruvian coast. Although the remains of this mature fetus were buried according to the regular funereal rites for Nasca infants, in an urn and among its peers, a difference was noticed: the remains of a newborn were found in the same urn, an unusual finding for Nasca practices. Skeletal analysis revealed the absence of the anterior cranial fossa, a single optic foramen due to the merging of the two orbits in the midline, the possible location of the nasal aperture above the fused orbits, and the presence of other midline malformations. The birth of a child carrying these features should have produced a great shock on the immediate family and on the society as a whole. Although ethnohistorical sources indicate that in immediate pre-European contact times malformed children were sacrificed to Illapa (the lightning god); the funerary context surrounding this case denies such practice during Nasca times.

Trauma Frequency Comparison Study between Chullpa 1 site and Muyucsha, Amazonas

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Charapoyas' "warrior" aspect is widely mentioned in ethnohistorical sources from the XVI century in order to characterize this pre-hispanic group. The kind of trauma registry, its frequency and its possible activities and/or associated events, were recorded to rebuild the characteristics of the present conflict in two Chachapoya filiation sites from the late Intermediate period: *Muyucsha and Chullpa 1 Condors' lagoon* in the cloudy forest of the Amazonian region in Peru. The macroscopic analysis recorded the registration and differentiation of the *antemortem and perimortem trauma*, and details such as mechanisms, types, location, sequences, and size of the injuries. The 39% of Muyucsha individuals have some wounds. In Chullpa 1, only 7.6% displayed lesions. The larger frequency of trauma was found in the skull where oval depressive fractures were found. Only one case of Parry fracture was identified. In the sex and age trauma frequency distribution, women show a scarcity of cases while children do not show injuries. Skull wounds were almost exclusively in men, being associated with war practices. Muyucsha cave people were more exposed to violence than Chullpa 1. The Comparative Study of Trauma frequencies and its characteristics allow us to discard the existence of great scale conflict or endemic war in these peoples. Indeed, the wounds standard can be understood as the consequence of occasional fights, or ambushes, using "chonta" spears and/or slings, which are mentioned in the history sources as the weapons used by Chachapoyas. Domestic evidence was not found. The wounds in general show bone recuperation, which means surviving after the fights.

Osteological Landscape

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The purpose of this study is to infer landscape features from adaptive changes evidenced in the lower skeleton. Indeed, stress markers prompt a variety of morphological changes in bone, which appear in response to the continuous interaction of humans with their environment. Therefore, the femora and innominates of 11 adults from the osteological collection of decontextualized skeletons at the University of Caldas' Biological Anthropology laboratory, were analyzed. The overgrowth of the linea aspera and other anatomical landmarks were interpreted biomechanically, pointing to specific activities including walking amidst an abrupt topography, such as the one found in Manizales. This study allowed us to establish a relationship between the changes in the structure of the femora and hips as an adaptive response to a particular topography. It is recommended to proceed on this line of research in order to improve the reconstruction of ancient peoples' lives.

Eggs of *Diphyllobothrium* in human coprolites: review of findings and a report of more eggs in the Camarones 14 Archaeological Site, north of Chile

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Paleoparasitology has helped to clarify questions about the presence of *Diphyllobothrium* cestodes in the Americas and other continents. The first evidence of prehistoric infection was provided from studies in human coprolites collected from sites in Peru. Later, eggs *D. pacificum* are described in material from Chinchorro mummies, who occupied the coastal region of Chile in 9000 years BP. Other studies report that the parasitic load of diphyllobothriasis of Andean populations varied according to fluctuations and intensity of El Niño / ENSO and that there is variation of the measurements of eggs. *Diphyllobothrium* may lead to diphyllobothriasis, a zoonosis transmitted by ingestion of plerocercoid larvae by eating raw or undercooked fish. More than 80 species of *Diphyllobothrium* are described, three in South America: *D. pacificum*, parasite of seals, sea lions, and other marine mammals, *D. latum* and *D. dendriticum*, which developed its cycle in freshwater. A review of the paleoparasitology findings for the genus *Diphyllobothrium* is presented, according to data available in literature. It is also reported the finding of eggs of *D. pacificum* in three of seven coprolites from the archaeological site Camarones 14, located in northern Chile, the Atacama desert, with average measurements 55,4-51,0 x 42,8-40,3 µm. The population associated with this site refers to the period Chinchorro, which already has been reported with *D. pacificum*. In one coprolite was found, in association with the eggs of *D. pacificum*, *Enterobius vermicularis* eggs with measures 59,0 x 39,0 µm, confirming the human origin. The coprolites date around 6,000 years BP, confirming data obtained from previous paleoparasitology studies of *D. pacificum* showing that this parasite is present in the Americas for at least 6,000 BP.

Are these the last Incas' bones? Analysis of human remains found at San Andres, first Spanish Hospital of Peru Vicekingdom ***

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St. Andreas Royal Hospital in Lima, first Spanish hospital of the Vicekingdom of Peru, is known, thanks to early chroniclers, as the last resting place of four Inca rulers. This fact has called the attention of historians and archeologists since the 1700s. In October 2005, four hospital areas were excavated. The first one showed all the stratigraphic sequence of the site, from the Late Intermediate (Ichma), to the Inca, Spanish, and Republican periods. The second one evidenced a colonial cemetery belonging to the hospital's graveyard. The third area presented the original hospital's floor and the remains of a well belonging to the insane ward. The last area presented a wide vault, which was believed to be the resting place of the Inca royal mummies. The vault contained disarticulated human skeletons, including skulls that had been cut in half and were covered with a thick layer of lime.

The bioarcheological analyses determined the minimal number of individuals, their dental register, their sex and age, as well as the presence of paleopathological and / or post-mortem alterations. It was possible to establish a total of 39 adult individuals, 10 males, 28 indeterminate, and possibly one female. The joint areas of the long bones revealed post-mortem holes associated with metal pieces, which assembled them for pedagogic use. Red and blue paint stains were registered as well on the bones, along with post-mortem cut marks on the long bones and skulls. All the evidence collected from the osteological analyses allow us to establish that the human remains of those individuals belonged to the anatomical amphitheater classes, which took place at the old Medical School of San Marcos University during the XIX century.

Skull trepanation in Middle Europe

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During the investigation of 650 Celtic skeletons from Dürrenberg/Austria ten skulls with trepanations were found. The details of the trepanation techniques and the different stages of bone healing were already previously discussed and presented. In a new project we focus on the socio-cultural aspects of such techniques in ancient populations in Austria. Were trepanations restricted to certain social groups within the population? And can we conclude from palaeopathological investigations causes of such surgical interventions? The anatomic location of the trepanation varied strongly within the group. Thus the parietal bone was targeted six times whilst the frontal bone three times and the occipital bone once. Two trepanations did not pass the internal lamina of the skull (symbolic trepanations). Six trepanations were performed with a trepan, three were scraped. Two showed cut marks and traces of a small punching tool. In three cases an inflammation of the region or an atypical opening of the skull could be interpreted as an operation performed after a trauma or infection. In eight cases the healing of the trepanation hole was completed and no traces of injuries or additional bone reactions could be detected.

In this group eight of ten individuals were identified as male whilst the others were indeterminate. These findings and results from other Celtic sites in Middle Europe suggest that this medical treatment was possibly only carried out in male individuals. This is in contrast to findings from the Neolithic and Bronze Ages where trepanation holes could be found in both, females and males.

It can be concluded that the motivation of these operations are rarely visible in the well healed cases. The different anatomical locations and the age range (from child to an old man) let us assume that some kind of pain might have been the main motive for performing a trepanation. There was a strong socio-cultural aspect to trepanations in this population, preferred were males regardless of the individuals' age.

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