Symposium 1. Age estimation in mummies.

Chairs:
Chiara Villa, University of Copenhagen, Denmark
Niels Lynnerup, Department of Forensic Medicine, University of Copenhagen, Denmark

The mummies are silent witnesses of old cultures and represent an unique opportunity to shed light on health conditions, disease and tradition of old populations. To preserve their integrity, the mummies should be investigated using the non-invasive techniques. However, many of the traditional methods, for example those for age estimation, are based on macroscopic observation of the bones or teeth. This symposium will show how the age can be estimated in the mummies using visual inspection, analyzing CT images and 3D visualizations and through the endoscopy. Speakers from around the world will present their experiences.

Symposium 2. Multidisciplinary practice in research and conservation of Egyptian mummies and artifacts at the Egyptian Museum in Cairo.

Chairs:
Sahar Saleem, Egyptian Museum in Cairo and Cairo University
Mahmoud El-Halwagy, Egyptian Museum in Cairo and Cairo University
Moamen Othman, Egyptian Museum in Cairo and Cairo University
Islam Ezzat, Egyptian Museum in Cairo and Cairo University

The Egyptian Museum in Cairo contains the world’s largest collection of mummies and other Pharaonic artefacts. Research and conservation of these priceless objects encouraged the collaborative work of experts in Egyptology, conservation sciences, and radiology. Radiology represents an accurate non-invasive method of mummy studies that has been used for decades. The first X-ray study of a royal Egyptian mummy from the museum was performed on Thutmose IV in 1903 by an Egyptian radiologist, Dr Khayat. Computed Tomography (CT) scanning provides a wealth of information and generates images of structures with different densities. The Egyptian Museum in Cairo is one of very few museums in the world that has a CT machine since 2004. This collaborative work helped to investigate and conserve several priceless objects including: human and animal mummies, wooden coffins, cartonages, stelas and other ancient objects that span more than 3,000 years, from the earliest kingdom to Grecoroman times.

Results helped identify age at death, gender, mummification style and date, detect hidden amulets, diagnose diseases, and suggest the cause of death. Preservation and maintenance of ancient mummies and human remains becomes doubtless one of the challenges for cultural heritage sciences. This experience entails the usage of conducted inert gases and oxygen free sacs and their characteristic benefits on keeping mummies stable. A comparative study between this technique and traditional ways of preserving mummies and human remains indicated the benefits of the modified technique.

Chairs:
John W. Verano, Department of Anthropology, Tulane University
Mellisa Lund Valle, International Committee of the Red Cross

Mummified remains present special challenges, both in the field and in the museum setting. Some geographic regions, such as Andean South America and Egypt, have especially large collections of mummies, with new material being discovered on a regular basis due to urban expansion and construction projects. While some museums have the infrastructure and funding to properly conserve mummies, many do not, and most archaeological storage facilities lack adequate conditions for storing mummies and conducting research on them. This symposium will review some of the challenges of mummy conservation and highlight attempts to address these issues.


Chairs:
Martha Palma, Centro de Investigaciones en Antropología Biológica y Genética (CIABG)
Corina Kellner, Anthropology Department, Northern Arizona University

Since the 1970s, archaeological research has incorporated the use of stable isotope analysis to understand individual lives. Biochemical analysis has become one of the main research lines in bioarchaeology. Mummies provide a particularly unique availability of human tissues (skin, muscle, bone, teeth, hair and nails) of ancient populations that highlight important components of ancient lives, such as diet, nutrition, and migration patterns, at different stages of development. This session provides the opportunity to discuss biochemical methods, including stable isotope analysis, to improve our knowledge about the lifestyles, nutrition, health and funeral customs of mummy collections. We welcome presentations on biochemical studies of mummies and skeletal collections as well as on biochemical methods that expand the utility of these types of analyses.

Symposium 5. Host-parasite relationships and diseases: lessons from the past. Session dedicated to Adauto Araújo†.

Chairs:
Raffaella Bianucci, University of Turin, Italy
Karl Reinhard, University of Nebraska, USA
Dong Hoon Shin, Seoul National University, South Korea

Many of the parasitic diseases that plagued ancient human populations continue to burden contemporary societies across the globe, and are far from being eradicated. Paleoparasitology is aimed at improving our understanding of the history of parasites and parasite population diversity over time, as well as the natural and anthropogenic conditions that contribute to parasite emergence and maintenance in human groups. Having contributed to shape the
dynamics of modern human populations, the study of the extinct populations coupled with the one of extant populations will allow reconstructing the temporal distribution patterns of both the parasites and their hosts. Indirectly, host-parasite relationships glean from the archaeological record also provide information on climate conditions, paleodiet and cultural/mortuary practices.

Adauto Araújo participated in these studies. At the time of his death, he began participating in projects that would broaden the field. This symposium summarizes the field and Adauto’s participation, including papers addressing new perspectives.


Chairs:
Patricia Maita, Museo Nacional de Arqueología, Antropología e Historia del Perú
Tiffiny A. Tung, Department of Anthropology, Vanderbilt University

This symposium on the bioarchaeology of war invites presentations that critically examine the various effects of war on communities, ranging from direct forms of deadly and sub-lethal violence to forms of structural violence that are seemingly indirect in their impacts. For example, times of war may exacerbate unequal access to dietary resources, making some groups more susceptible to malnutrition and the inability to effectively fight off disease. Warfare can also displace people, as families and communities migrate to unknown lands or are forcibly moved; this can have the added effect of severing kinship ties, trade alliances, and other networks necessary for a community to thrive. The traumatic effects of war can also get “under the skin”, altering the expression of genes, as recent epigenetic studies have shown.

Symposium 7. Ancient bodies: the interplay between ancient culture, spiritual beliefs and mummification.

Chairs:
Raffaella Bianucci, University of Turin, Italy
Despina Moissidou, National Kapodistrian University of Athens, Greece
Dong Hoon Shin, Seoul National University, South Korea

Mummification implies the intention to preserve the dead’s features. Scholars have extensively focused their attention on the environmental conditions and embalming practices- that allowed the process of mummification to occur- and to the study of the ancient pathological conditions and life habits. A broad scientific knowledge has been acquired. On the other hand, the interplay between past populations- witnessed by their mummified bodies- and their afterlife world has been less investigated. Apart from the Egyptian civilisation that has received much attention over the past 200 years, the cultural contexts and the spiritual needs of past populations to maintain their ancestors’ identities have been investigated to a lesser extent. Mummy experts from different regions of the world are called to reconstruct the cultural/spiritual background of past populations introducing us into their lost worlds through the analysis of the corpses they left behind. Contact points and divergences in the cult of dead across the world will be pinpointed and the results of the seminar will be summarised in a
report, the scope of which is to help scientists gain awareness of their own actions in the scientific field.

**Symposium 8. Mummies and textiles**

**Chairs:**
Jana Jones, Macquarie University, Australia  
Dong Hoon Shin, Seoul National University, South Korea  
James M. Vreeland Jr., Patronato del Patrimonio de la Salud

Mummies discovered worldwide become one of the most invaluable resources for studying on health and disease status of human populations in different time and space perspectives. Using the mummies and relating samples, invaluable information could be obtained successfully, by a variety of scientific techniques. However, they are not only the subject we could talk about mummies. Rather, very unique remains could be acquired from the sites where mummies have been discovered. Of them, it is the ancient textiles that get the most attention. In fact, different kinds of textiles used for clothing, ornament or simple patches could be collected from mummies discovered in the world. By studying on them, we can get very crucial clue for reconstructing textile history in each country, very helpful to comprehend the vivid aspects of human lives before 20th century. Although there were a number of fascinating reports about the mummy-relating textiles from every corner of the world, the comprehensive review on the findings has not been presented yet.

**Symposium 9. Free topics.**

**Chairs:**
Carlos Herz, Centro Mallqui  
Elsa Tomasto-Cagigao, Pontificia Universidad Católica del Perú

**Symposium 10. Mummy genomics: molecular investigations of mummified human remains.**

**Chairs:**
Albert Zink, Institute for Mummies and the Iceman, Italy  
Johannes Krause, Max Planck Institute for the Science of Human History, Germany

Next generation sequencing (NGS), often in combination with DNA capture techniques, revolutionized the field of palaeogenetics in the last decade, providing a better understanding of human evolution through time, human population dynamics, and host pathogen interactions. The reconstruction of complete ancient human and pathogen genomes has led to insights into the ancestry of present day populations in the Old and New world and the evolution of some of the pathogens that caused major outbreaks in human history, such as plague, leprosy and tuberculosis.

Although paleogenetic studies of skeletal material from various geographic origins and time
periods are generating an increasing amount of ancient genome-wide data, only few studies have focused on mummified remains. One of the first mummies for which whole genome reconstruction was attempted successfully, is the 5,300 year-old Tyrolean Iceman. The sequencing revealed detailed information on his ancestry, his physical appearance, physiological parameters and the presence of pathogens and disease susceptibility, showing the potential of genomics for mummy research.

In this symposium we will present possible applications of NGS approaches for the study of mummies and discuss its potential, the related methodological challenges and limitations. The contributions will range from state-of-the art lectures on the application of NGS to ancient human remains as well as genomic and metagenomic approaches of ancient commensal and pathogenic microbes. A particular focus will be given to the application of these methods in the scientific study of mummies and the future perspectives of paleogenetics in South America. The organizers of the symposium will try to bring together international experts in paleogenetics as well as scholars from South America who are involved in mummy studies, in order to enhance the exchange of knowledge and discuss possible future directions.


Chair:
Salima Ikram, American University in Cairo, Egypt

The mummies of animals deserve an important place in this meeting. Studies of animal remains have provided information on human migration, domestication processes, cultural practices that reflect social, economic and religious aspects of the history of human societies. Intentionally or not, a great variety of animals became mummified all over the world. Ancient Egypt is where the greatest amount and variety of animal mummies have been recovered and studied. Large and small, wild and domestic, birds, cats, dogs, crocodiles, cattle, monkeys and others were prepared to be used as food, afterlife company, ritual assistants. Life and death in Pharaonic Egypt had an important connection with the preparation, use, and burial of animal mummies that were prepared in some cases in industrial numbers.

The study of animal mummies in other parts of the world is also providing an interesting scenario with multidisciplinary approaches incorporating genetics, parasitology, study of zoonotic diseases, among other fields, to contribute to the reconstruction of cultural history. In some cases these studies have become pivotal to understand the evolution of diseases such as tuberculosis.
This symposium will include specialists from various disciplines that have focused their research on animal remains.

Symposium 12. Radiography in bioarcheology. Tribute to Marvin Allison†.

Chairs:
James N. Skufis, Washtenaw Community College
Sonia Guillén, Centro Mallqui
For the last 100 years radiography and forensic imaging have been helping researchers uncover pathologies, artifacts, biodata and even checking the authenticity of fake remains. This symposium will present papers that will highlight the role of radiography in bioarchaeology showing its advantages as well as its limitations. There are examples about how its early application in the excavation process can contribute to the preparation, study and conservation of the recovered mummified remains. The advent and impact of new imaging technologies, and the selection of imaging modalities according to field and lab conditions will be discussed.

**Symposium 13. Identity and gender**

**Chairs:**
Maricarmen Vega, University of Western Ontario  
Sofía Chacaltana, Universidad Antonio Ruiz de Montoya

Recently, studies on how people conceptualized and express themselves individually and inside their own groups are given more attention. This symposium is focused in how the study of the human body gives lights about social, cultural, ethnic and gender identity. How identity is embodied? Which body expressions make a person distinct from others? And, how these individual expressions affect the overall communal identity? The first goal of this conference is to link the biological and the social identities. We emphasize the importance of the observation of single cases and the possibilities that osteobiography offers in the study of the individual and collective identities through the reconstruction of the biological profile, the examination of the bodily expressions (e.g. tattoos, cranial modification, hairstyle), and other ethnic markers. At the same time, we want to deepen in the study of gender roles in the past. This perspective is crucial because its intersection with other social identities provides a more fluid and deeper discussion. Gender is a complex identity which is transformed through time and space. The ways in which an individual (and society) perceives and displays aspects of their own identity (and other types of identities) change during their different life stages and even beyond death. Thus, gender is far from being a monolithic and “non-problematic” identity; it is always in contestation and under construction. Therefore, the combination of biological studies and gender perspective will enrich the debate about the non-static role that individuals played in shaping societies of the past.

**Symposium 14. From autopsy to diagnostic imaging and metagenomics: guidelines, levels of evidence and medical data**

**Chairs:**
Frank J. Rühli, Institute of Evolutionary Medicine, Switzerland  
Raffaella Bianucci, University of Turin, Italy  
Dong Hoon Shin, Seoul National University, South Korea

Bioethical guidelines in mummy research imposed scholars to avoid unnecessary damages to ancient people corpses. Therefore, in the past two decades, mummy professionals resorted
mainly to the use of non-invasive techniques; these enable to verify the state of preservation of the internal cavities, without harming the bodily integrity, and to propose a series of differential diagnoses. Despite the undeniable advantages, also non-invasive techniques have their drawbacks. CT imaging does not always allow one to perform a clear differentiation between mummified organs, particularly when these are seriously deformed and dislocated by dehydration. Dehydrated organs display similarities in radio-densities, which, in turn, may lead to misdiagnosis. To mitigate possible biases in the interpretation of paleo-radiological findings, guided endoscopy has been associated to CT imaging. Although some successful studies were reported, due to the narrow visual field of the endoscope, often organs still cannot be visualized at the desired extent. In the clinical field, the correct interpretation of CT images has been achieved throughout a continuous comparison process with the data emerged from repeated post-factum dissection, histological investigations included. Cumulative results from traditional autopsies performed on mummies from all areas of the globe should be reconsidered as a positive contribution to the field as they will help to prove the authenticity of diagnosis obtained through CT acquired data. Today, medical data acquired from both invasive and non-invasive techniques greatly benefit from the input given by paleogenetics. Recent advances in metagenomics, either performed on inner organ biopsies, teeth or dental calculus are constantly improving our knowledge on the antiquity and microevolution of human past diseases. Finally, guidelines on how and when to perform different diagnostic approaches on ancient mummies are lacking and are desperately needed.

**Symposium 15. Paleocardiology.**

**Chairs:**
Guido Lombardi, Universidad Peruana Cayetano Heredia  
Linda Sutherland, Newport Diagnostic Center, Newport Beach, CA, USA

Computed tomographic evidence of atherosclerosis has been found in the bodies of mummified human remains. This symposium reviews the findings of atherosclerotic calcifications in the remains of ancient people who lived across a wide span of human history with a wide range of diets and lifestyles. Study of the genetic risk factors for atherosclerosis in ancient people and cross-species may offer insights into this common ancient and modern disease.

**Symposium 16. Mummies of the state of Queretaro, Mexico.**

**Chair:**  
Elizabeth Mejía Pérez Campos, INAH Queretaro

About 21 years ago were found the first mummified remains in the State of Queretaro; they leave remained in the oblivion so this year we come into contact with some authorities to start an interdisciplinary research project for the study of this mummified body, which is presumed is in the colonial period, in Queretaro. This symposium presents two works that make reference to the first stage of this body, which is about an adult who we will call "Clara", by having been recovered from Santa Clara’s convent. However, it was 13 years ago that the remains of the
child Mummy "Pepita" were analyzed in an interdisciplinary project. The remains of this child Mummy are currently at a stage of seeking the best way to their divulgation; This Panel explores the fields of Visual Arts, cinematographic production, augmented reality and virtual images as an alternative form of release the results of our research.


Chairs:
Kenneth C. Nystrom, Anthropology Department, State University of New York
Lorna Tilley, Australian National University

Since the development of mummy studies as a scientific discipline in the 1970’s, the diagnosis and epidemiology soft tissue diseases has been a dominant research theme. Despite the disciplinary background of the field’s researchers, however, there has been relatively little attention paid to the behavioral and cultural context of disease and in particular the presence and nature of any health-related care. The recently developed bioarchaeology of care is an approach that provides a framework for reconstructing evidence of health-care at a case-study level. Given that bone is limited in its response to pathogens, to date the analytical focus has typically been opportunistic, restricted to the relatively few serious and potentially disabling diseases capable of registering in the skeleton. The preservation of soft tissue and other associated material (e.g., gut contents, coprolites) affords the opportunity to observe a wider range of pathological conditions and presumably a greater chance of observing, or inferring, evidence of care. The reconstruction of care and provisioning represents a significant and worthwhile avenue of investigation for mummy studies, one that will complement current foci in the field while fostering a more holistic approach to the investigation prehistoric disease. Advances in medical imaging and molecular analyses have improved our ability to identify, diagnose, and discuss the evolution and impact of disease in the past. By considering evidence of accommodation and provisioning within its cultural and historical context, researchers have the opportunity to contribute significantly to our understanding of the human response to disease.

Symposium 18. The history and archaeology of Andean mummies.

Chairs:
Christopher Heaney, University of Texas, Austin
Alexander Menaker, University of Texas, Austin

This set of papers offers varying methodological approaches and wields multiple lines of evidence to trace and illuminate how the often-mummified dead in the Andes were produced, cared for, and interpreted from the late pre-Hispanic period and to the recent past and present. Following the enduring and indelible presences of pre-Hispanic pasts and the tangled legacies of colonialism and nationalism, these papers address the shifting meanings, circulations, and contexts of the remains of the past and those who lived it, and studied it. In doing so, these investigations offer new evidence and compelling interpretations of the inevitable importance
of death and life, and their particular manifestations and unanticipated trajectories of appreciation and study in the Peruvian Andes and beyond. Moreover, while the primary evidence for some of this research draws from Spanish and European colonialisms and their enduring effects, other evidence comes from the reconstruction of the study and transmission of mummies in the twentieth century. Together these papers provide productive ways to use these findings to yield new insight into the roles of mummies and the dead in recent histories of archaeology, as well as deeper pre-Hispanic histories.

Symposium 19. Andean mummies: scientific research and social impact.

Chair:
Sonia Guillén, Centro Mallqui

Andean mummies have become part of their communities, either as a myth, a direct presence, an attraction to visitors, and/or a source of identity and pride. This session presents several cases that over many years have had local and regional impacts. The review includes contextual information on a variety of mummies as well as the development of additional scientific and development projects.

Symposium 20. The study of mummies in the reconstruction of mortuary rituals.

Chairs:
Elsa Tomasto-Cagigao, Pontificia Universidad Católica del Perú
Lucía Watson, Universidad Nacional Autónoma de México

Death rituals imply a series of actions whose traces are not always fossilized in the archaeological record. Among these actions, those related to the preparation of the body count among the least frequently preserved due to the facility with which soft tissues of the body decompose and are destroyed together with all nearby organic materials. Different phases of ritual and also aspects of the construction and reconstruction of identities can be defined based on their relationship to the processes of body decomposition and desiccation. In these phases more elements around the body can be added but also removed, replaced or rearranged. In this symposium we present studies of mummies and associated elements and their implications for the reconstruction of mortuary ritual. These studies include the application of different methodologies from different theoretical perspectives, and present also different challenges to the preservation of diverse materials.

21. Posters

Chairs:
Marcela Urízar, Universidad de Atacama, Chile
Alejandra Valverde, Centro Mallqui