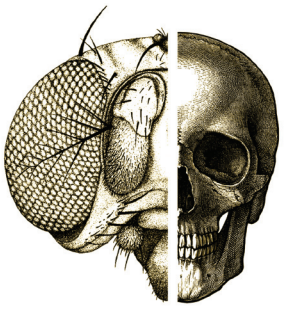
3RD INTERNATIONAL CONFERENCE IN FUNERARY ARCHAEOENTOMOLOGY



ICFAE 2019

3rd International Conference in Funerary Archaeoentomology

BORDEAUX June 5th, 2019

Pôle juridique et judiciaire
35, Pey Berland square

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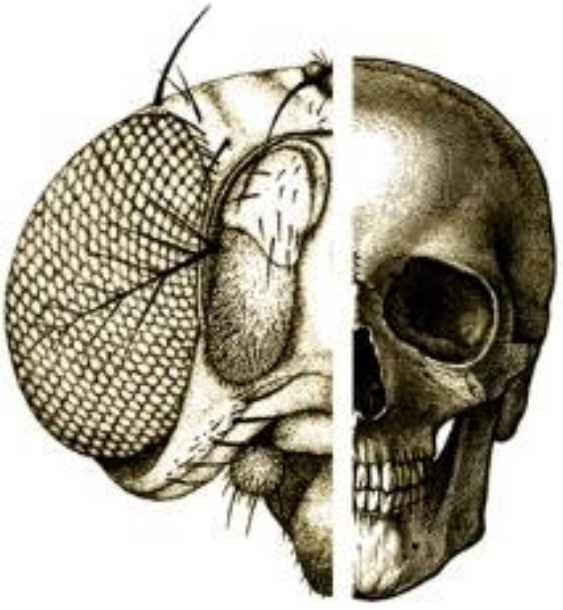

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35, Pey-Berland square

June 5th, 2019

University of Bordeaux, France

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	5th May 2019 Legal and Judicial dpt building
8.30-9.15	*Registration* (entry hall)
9.15-9.30	Welcome Speech (room 1K / 1st floor)
9.30	Keynote Speaker
9.30-10.30	**Philippe Ponel** Quaternary Entomology, archaeoentomology: how subfossil beetles help to reconstruct past environments and human activities
10.30	Oral Communications Section I Chairman S. Vanin
10.30-11.00	**V. Forbes, J.-B. Huchet, R. Knecht** The Archaeoentomology of a Conflict Scene: Blowflies and Ectoparasites from Pre-Contact (16-17th c. AD) Yup'ik Nunalleq, Alaska
11.00-11.30	**Coffee break**
11.30-12.00	**A. Napias, L. Rozada, M. Matu, J.-B. Huchet, A. Souron** Towards quantitative identification of insect-induced bone surface modifications? Geometric morphometrics-based shape analysis of 3D topographic models applied to insect-induced traces
12.00-12.30	**P. Kirgis, C. Bou, S. Lemaitre, A. Thomas, J.-B. Huchet** Contribution of Archaeoentomology, Archaeoparasitology and 3D reconstruction to the study of Prehispanic human mummies
12.30-14.00	**Lunch Time**
14.00-14.30	Poster session (room RE, ground floor)
14.30	Oral Communications Section II Chairman M. Hall
14.30-15-00	**F. Tuccia, G. Giordani, S. Vanin** Taphonomic processes of Diptera puparia in archaeological contexts
15.00-15.30	**P. Henríquez, N. López Dos Santos, P. Vidal Matutano, T. Delgado Darias, V. Alberto Barroso, F.o Javier Velasco Vázquez** Archaeoentomology of the funerary spaces of the ancient Canaries
15.30-16.00	**J. Pradelli, G. Giordani, F. Tuccia, S. Vanin** Is the minimum number of individual fundamental during entomological analyses in archaeological contexts? The Castelsardo (Sardinia, Italy) case
16.00-16.30	**Coffee break**
16.30-17.00	**S. Vanin** Archaeo-entomology: funerary, funéraire, funerario/a, *funebris*, *fumus*, *funus*, φόνος, dhûmu, dhû
17.00-18.00	Discussion and conclusions
18.00	**3rd ICFAE conference Closing Cocktail and EAFE Welcome reception**

Oral presentations
and
Poster presentations

Quaternary entomology, archaeoentomology: how subfossil beetles help reconstruct past environments and human activities

Philippe Ponel [1]

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Fossil Coleoptera are abundant in almost every type of quaternary sediment. Fossil species are absolutely identical to modern living species. Morphological and physiological stability, narrow ecological needs and rapidity of response to environmental changes make beetles exceptional material for palaeoecological and palaeoclimatological studies. But insect data may provide also abundant and original information concerning past human activities and anthropogenic environment. This field of research is illustrated with two examples. At "Place du Général-de-Gaulle" in the city centre of Marseille, archaeological excavations provided sediment samples spanning the period 14th-17th century AD and enabled insect analyses to be made in order to reconstruct vegetation and landscape of the ancient city outskirts. Insect assemblages reveal that fauna and flora in the area were heavily transformed by agriculture and pastoralism, to the benefit of "garrigue". Insect evidence suggests that *Olea europaea* (olive tree) and *Ficus carica* (common fig) were cultivated. Nitrophilous plants along with dung beetles indicate that livestock was abundant. Herbaceous plant dependent Coleoptera show that a ruderal vegetation associated with wastelands was established. High numbers of beetles associated with pieces of wood soaked with seawater agrees with the hypothesis of a shipyard located nearby, and both halophilous ground-beetles and plants indicate that saltpans were probably established in the area, as suggested by archaeological and historical data. At Charleville-Mézières, analysis of sediment sampled in a Gallo-Roman well provided about 140 taxa of Coleoptera, enabling to reconstruct in details the vegetation cover close to the site. The overwhelming dominance of a characteristic forest fauna is striking, but beetles associated with nitrophilous plants are also present, along with a small group of coprophagous and coprophilous Coleoptera associated with cattle. These beetle assemblages suggest that the well was located in a dense and mature forest and not in open grasslands.

The Archaeoentomology of a Conflict Scene: Blowflies and Ectoparasites from Pre-Contact (16-17th c. AD) Yup'ik Nunalleq, Alaska

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This paper presents the results of a pilot study that incorporates archaeoentomology in the investigation of a scene of indigenous conflict. At Nunalleq, a pre-contact Yup'ik site in southwestern Alaska, excavations revealed the remains of a large sod village that was abandoned following an attack. The final occupation layers are overlain by charred roof sods strewn with projectile points and shafts and associated with these deposits are the remains of some of the conflict victims. Although Yup'ik oral history contains numerous tales and legends associated with a period of intense violence, referred to as the 'Bow-and-Arrow-Wars', Nunalleq is the only site where evidence of this conflict has been extensively excavated. Archaeoenvironmental samples collected from archaeological layers contemporary with the attack produced hundreds of human and dog lice, fleas, as well as blow fly puparia. In an attempt to reconstruct the timing (seasonality), spatiality and sequence of events that characterised the attack on Nunalleq, we integrate the results of archaeoentomological analyses with other bioarchaeological (e.g. human hair, fur, coprolites) and artefactual (projectile points, pieces of clothing) data. Our results demonstrate how, by incorporating innovative methods in archaeological investigations of past violence, it is possible to reconstruct detailed, engaging and historically accurate narratives of past conflict based on physical evidence.

Towards quantitative identification of insect-induced bone surface modifications? Geometric morphometrics-based shape analysis of 3D topographic models applied to insect-induced traces

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Bone surface modifications (BSM), including the ones left by insects, are relevant sources of information to characterize the taphonomic history of bone assemblages in archaeological and palaeontological contexts. Currently, the identification of the bioagents responsible for leaving BSM relies predominantly on qualitative characterizations of whole assemblages combined with contextual data. Morphologically similar BSM can also be left by different bioagents and this equifinality further hinders identification of isolated traces. In the Cretaceous site of Angeac-Charente (France), two plates of turtle shell (Pleurosternidae: *Pleurosternon bullockii* Owen) display enigmatic circular or irregular oval shallow grooves. This site also yielded numerous coprolites of termites (ichnotaxon *Microcarpolithes hexagonalis* Vangerow) associated with wood (*Agathoxylon* Harting). Although BSM left by termite osteophagous activity in experimental contexts are overall well known, BSM similar to the ones observed in Angeac-Charente were never previously reported. We analyzed BSM produced by extant subterranean termites (Rhinotermitidae: *Reticulitermes flavipes* (Kollar), *R. grassei* Clément, and *Heterotermes tenuis* (Hagen)) during recent experiments. They represent circular shallow grooves that are superficially similar to the Cretaceous BSM from Angeac-Charente, albeit smaller in size. To compare the fossil and experimental BSM, we applied a recently developed method based on quantitative analyses of microtopography. We first built high-resolution tridimensional topographic models of fossil and experimental traces using confocal microscopy. We then extracted cross-section profiles of the shallow circular grooves and conducted shape analysis of those profiles using geometric morphometrics (Procrustes superimposition of landmarks). We compared shape and size of the profiles extracted from fossil and experimental traces and discuss whether the fossil traces could be attributed to termite osteophagous activity. The new method presented here is adaptable to various types of insect-induced BSM and is therefore a promising tool applicable to numerous archaeological contexts where insects are potential agents of bone modification.

Contribution of Archaeoentomology, Archaeoparasitology and 3D reconstruction to the study of Prehispanic human mummies

Pauline Kirgis [1, @], Christophe Bou [2,1], Serge Lemaitre [3], Aline Thomas [4], Jean-Bernard Huchet [1, 5, 6]

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While the entomofauna associated with human and animal mummies in ancient Egypt is relatively well documented today, few archaeoentomological studies have been devoted to pre-Hispanic mummies, despite their high prevalence in most of the American and European museums. We present here the first results of an archaeoentomological and archaeoparasitological study conducted on the corpses of 11 complete and/or partial human mummies, mainly Peruvian, from the collections of the *Musées Royaux d'Art et d'Histoire* in Brussels and the *Musée de l'Homme* in Paris. These investigations led us to evidence a large number of insect remains belonging to 10 distinct orders that allow us to propose some initial assumptions, both on funerary practices but also on the health status of these ancient populations (or civilisations) of South America.
In conjunction with this study, we have experimented with a new approach by the mean of tomodensitometry and virtual 3D reconstruction of some anatomical regions that may have been colonised by insects at the time of death or later, on display in Museums. Thus, a new protocol for detecting entomological remains has been implemented on 4 mummified bodies. In the first part, segmentation and thresholding on multiplanar 2D sections visualize the entomological remains. Then 3D volumetric reconstruction using reconstruction filters adapted to the entomological material allowed non-invasive exploration of funerary bundles specific to the pre-Hispanic world and the respect of museum conservation standards. Finally, the detection of insect remains within mummies and funerary bundles appears as a useful mean for future endoscopic investigation allowing precise sampling on previously well-identified areas.

Taphonomic processes of Diptera puparia in archaeological contexts

Fabiola Tuccia [1,2,@] , Giorgia Giordani [2,1] , Stefano Vanin [2,1]

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The puparia of Diptera and the exoskeleton of adult Coleoptera or other Arthropoda represent the majority of the remains investigated by archaeoentomologists and paleoentomologists. Through the study of these specimens, a more comprehensive understanding of archaeological contexts can be gained, providing new insights of past human activity, habits, climate and biodiversity changes. Depending on the environmental conditions, insect remains can show differing states of preservation which can be a further element to enable virtual travel through the past events. In this work, the mineralization of Diptera puparia collected from two Sardinian archaeological sites (Italy) is reported and described as an unusual and peculiar taphonomic process. In 1965, some excavations in the city of Macomer (Northern Sardinia) revealed the presence of intact burial areas with human bones that were five thousand years old, covered by a mixture of mud and water. Clusters of mineral compounds were found attached to the bones and mineralised puparia of Muscidae and Calliphoridae nestled within them. On the other hand, in 2011 surface renovation works in the city of Sassari (North-west Sardinia) led to the discovery of a medieval well initially used to collect rainwater and finally used as a dump. Hundreds of mineralised Diptera puparia (Fanniidae, Muscidae and Sphaeroceridae) were found buried deeply in the ground. The presence of decomposing organic matter and water are two common elements shared by these two different sites. In both cases we assume that the roughly constant waterlogged conditions favoured the conservation of the biological remains and the environmental circumstances contributed to the precipitation of the mineral ions present in the surrounding soil. The minerals which replaced the "flies" under metamorphosis were investigated using several microscopic and chemical techniques. Further research might allow us to clarify the cause of such a fascinating phenomenon.

Archaeoentomology of the funerary spaces of the ancient Canaries

Pedro Henríquez [1,@], Nestor López Dos Santos [2,1], Paloma Vidal Matutano[1], Teresa Delgado Darias [3], Verónica Alberto Barroso [4,1], Francisco Javier Velasco Vázquez [1,5]

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The island of Gran Canaria (Canary Islands, Spain) was colonised in the first centuries AD by North African populations. Those people lived in this territory practically isolated until the 13th-14th centuries as a result of the European Atlantic expansion. During this time, the caves were used as funeral deposit, generally with a collective character and maintaining a direct relationship with the living spaces. The environmental conditions of these caves, as well as the climate of the islands, have favoured optimal conditions for the preservation of the organic matter in this type of burial. All this leads to the preservation of human soft tissues as a result of natural mummification processes, also the plant fibres and animal skins used to shroud the corpses, the wooden elements used in the funeral practice and, as has been observed in recent years, abundant sarcosaprophagus insects.

In this work we aim to show the preliminary results of the archaeoentomological analysis of two funerary boards deposited in El Museo Canario between the end of the 19th century and beginnings of the 20th century. These boards were used as support elements to place the corpses in funerary caves and they still contain a number of sarcosaprophagous insect remains that belong to the mummies with which they are associated. Therefore, they can provide significant information about the burial patterns and the conditioning of the funerary spaces. The multidisciplinary analysis has contributed to clarify the functionality of these wooden elements in the funeral practice, as well as the particular conditions in which the process of decomposition of the bodies that were in direct contact with them took place. The analysis of these insects has helped to understand other significant issues such as the wood selection processes, woodworking activities and taphonomical features observed in the identified woody taxa.

Is the minimum number of individual fundamental during entomological analyses in archaeological contexts? The Castelsardo (Sardinia, Italy) case

Jennifer Pradelli [1,2,@], Giorgia Giordani [1,2], Fabiola Tuccia [1,2], Stefano Vanin [1,2]

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In the last few decades, attempts have been made in archaeology to use faunal analysis for demographic, ecological, economic, and sanitary interpretations of the past. These evaluations are based on the composition of the animal communities but as well on the potential number of specimens present in the site. However the quantification of assemblage of animals' remains in a specific archaeological site is difficult and very often imprecise. Critical reviews and considerations have recently pointed out many issues concerning the biases associated with this calculation.
The most common and wide spread currently in use unit of quantification is the MNI (minimum number of individuals). Other units such as the MNE (minimum number of elements) and the NOIS (number of identified specimens) are also considered by scientists depending on the context.
However, are those measures useful in archaeo-entomological analyses? Can you interpret or evaluate an insect's assemblage without calculating them?
Problems such as methodical recovery of samples, variations on depositional pattern and persistence's variability of different taxa have to be considered carefully.
This case study reports the results of two subsequent funerary archaeo-entomological analyses performed on insects' remains collected from human mummified remains founded inside the crypt of the Sant'Antonio Abate Cathedral of Castelsardo (Sardinia, Italy) in two different years.
Despite the fact that both batches come from the same site of the same historical period, the analysis of the insects' assemblages showed a drastic difference in abundance and variability. Various explanations, such as expertise differences in sampling entomological remains between archaeologists and entomologists, are presented and discussed comparing the first and the second analysis and their impact on the interpretation of the archaeological site.

Archaeo-entomology: funerary, funéraire, funerario/a, *funebris*, *fumus*, *funus*, φόνος, dhûmu, dhû

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In 1996, Jean-Bernard Huchet used for the first time the words "funerary archaeoentomology" or, better, "archéoentomologie funéraire" to define a new original approach to interpret archaeological burials using the analysis of insects associated with human remains. The discipline shares with forensic entomology the same bulk of knowledge however the two disciplines are well distinct.
During the 2nd ICFAE in Treviso (Italy) the word "funerary" was criticised because it was "potentially" too related with the idea of funerary ceremony and not with the concept of "death". The words funerary (English), funéraire (French), funerario/a (Italian and Spanish) have their etymology in the Latin word *funebris* that is deeply connected with the word *funus* that contains the root *dhû* of the Sanskrit *dhûmu*. This word becomes *fumus* – *funus* in Latin and *φόνος* in ancient Greek referring to smoke and to homicide.
In general the root *dhû* can refer to the "vapour" that comes from a burning cadaver and remains in the air for a while. From a semantic point of view these words refer to the death (often violent death).
The adjective *funebris* derives from the form *funus ferre* that literally means "bringing the death" referring to all the funerary ceremonies - with the exclusion of the *exsequiae* and the *pompae funebres* – but as well to the death and the cadaver. In particular several Latin authors, such as Cicero, Titus Livius (i.e. Livy), Virgil, Petronius and Seneca, used the words *funus* and *funebris* referring to the cadaver and to the death. This presentation aims to verify and confirm the use of the words "funerary archaeoentomology" for the discipline that, defined by Huchet in 1996, is growing day-by-day providing an original tool to the archaeologists to describe what happened in the past.

Identification of dermestid beetle modification on Neolithic Maltese human bone: Implications for funerary practices at the Xemxija tombs

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Neolithic funerary practices in Malta are characterised by collective burial in rock-cut tombs, caves, and hypogea. The skeletal assemblage from the Xemxija tombs, a series of six rock-cut tombs in northern Malta that were used for deposition for an extended period, from at least 3500–2450 cal BC, contains almost 15,000 fragments of human bones. Until now, the lack of excavation records and aggregated human bone assemblage has impeded an interpretation of the process of collective burial in the Xemxija rock-cut tombs. In a recent study (Thompson *et al.*, 2018), a small number of fragments (*n* = 45) were observed to present circular or ovate borings. Application of microscopic analysis, computed tomography (CT) scanning, and 3D imaging of a number of bones showing modifications allowed their comparison with similar examples in modern and archaeological skeletal material. More recently, severalbone fragments showing similar modifications have been recorded from the Xagħra Circle hypogeum on Malta. The modifications are interpreted as pupal chambers and feeding damage by dermestid beetles. Based on observation of the behaviour and ecology of dermestid beetles, we suggest several scenarios for funerary practices at the Xemxija tombs which nuance our current understanding of collective burial during the late Neolithic in Malta.

Reference cited:
Thompson J.E., Martín-Vega, D., Buck, L.T., Power, R.K., Stoddart, S. Malone, C. 2018. Identification of dermestid beetle modification on Neolithic Maltese human bone: Implications for funerary practices at the Xemxija tombs. *Journal of Archaeological Science: Reports* 22:123–131.

Man-eating termites: Osteolytic lesions upon human skulls perpetrated by subterranean termites (Insecta : Isoptera)

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Osteolytic lesions on human remains resulting from insect activity are relatively unknown by anthropologists and palaeopathologists. However, traces on bones related to the activity of subterranean termites (Isoptera) are undoubtedly among the most frequent taphonomic alterations found both in the fossil record and in archaeological contexts. The effects of these lesions on the bone matrix sometimes simulate certain degenerative or infectious bone pathologies (pseudopathologies) or imitate certain peri- or post-mortem anthropic interventions (projectile impacts, trepanation, etc.). The lack of knowledge of the osteophagous behaviour of subterranean termites and the bioerosions resulting from this activity has led some former authors to erroneous retrospective diagnoses by attributing these traces to cannibalism practices or trepanations, with some even considering these lesions of taphonomic origin as obvious evidence of the existence of syphilis on the African continent during prehistoric periods.

Through different examples of distinct geographical, cultural and chronological contexts, we present here a brief illustrated synopsis of osteolytic damage perpetrated on human skulls by various subterranean termite taxa. Although the osteolytic lesions caused by these insects show significant diversity, the existence of several discriminating criteria, isolated or combined (e.g. tunnelling, subcortical galleries, star-shaped traces on surface, circular or elliptical depressions) allows, in most cases, a reliable retrospective diagnosis.

A case study: Termites as natural agents of postdepositional taphonomic alterations upon a prehistoric human skeleton from a Middle Holocene archaeological site, Toca do Enoque (Piauí, Brazil)

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Termites are insects that often appear in archaeological contexts in Brazil, that are rarely studied as natural processes of deposit formation and archaeological contexts. The probability of finding marks of these insects that modify carcasses of animals and humans in archaeological sites in Brazil and South America is relevant. From a theoretical - methodological approach that includes Ichnoarchaeology and Funerary Archaeoentomology, we present the case study of a human skeleton with signs of bioerosion due to the action of subterranean termites from the Middle Holocene archaeological site, Toca do Enoque (Piauí, northeastern Brazil). Guided by an actualistic study protocol, we were able to record that the pattern of damage observed in the human bones was consistent with the osteophageal behaviour of certain termite species endemic to the neotropical region (Termitidae). The macroscopic analysis shows the importance of recognising subterranean isoptera as natural taphonomic agents that act in postdepositional degradation of human bone remains from archaeological burial contexts.