YNHM : Young Natural History scientists Meeting

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Biodiversity Dynamics and Conservation
Have the spawning habitat preferences of sardine (Sardina pilchardus) in the southern area off the Moroccan Atlantic coast (21-26°N) changed in recent years?

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Sardine (Sardina pilchardus, Walbaum 1792) is one of the most exploited pelagic species along the northwest African coast. The main spawning occurs during the cold season (autumn–winter). Samples of sardine eggs were collected along the southern area of the Moroccan Atlantic coast (26–21°N) through 13 surveys carried out during autumn–winter periods from 1994 to 2015. The present work focuses to investigate the inter-annual variability of the spawning habitat through spatial-temporal variability of sardine eggs distribution and densities using data collected over the period 1994-2015. Sardine egg production and centroid position were variable from year to year. A global quotient analysis on sardine egg densities in relation to sea surface temperature (SST) derived from in situ measurements showed that the spawning thermal window has been shifted to higher temperatures in the period of 2000’s compared to the 1994-1999 period where the thermal spawning window of sardine was 16-18.5°C. Generalized additive model (GAM) were used to detect the relationships between the sardine distribution (egg density and presence/absence data) and the relevant environmental variables. Three environmental variables (salinity, temperature and zooplankton biomass) were taken into account. Generalized additive models depicted significant relationships between the environment and eggs sardine density but not with eggs presence. Given that the study area is characterized by high mesoscale features and significant upwelling activities, the variability of upwelling processes could explain the changes of spawning ground position and thermal window.

Keywords: Sardine, Spawning habitat, Environment, Time series, Sea surface temperature.

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Introduction to Inventory of Yemen’s Coastal Wetlands

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Wetlands have considerable importance as biodiversity holders (habitats, animals and plants), while they provide several resources and benefits to local communities in different parts of the world. In addition, wetlands can buffer pollutions, absorb floods and recharge aquifers. However, since 1980, more than 80% of the wetland have been lost, by drainage, urban expansion, industries, covering, etc. That why it is important for people to protect, monitor and properly manage and develop wetlands. Yemen has been identified as hosting globally important biodiversity, thanks to its situation at crossroads between the Afrotropical, Oriental and Palearctic regions. This biodiversity is particularly rich in coastal wetlands. Despite this richness both in patrimonial and social resources, these wetlands show many threats, making their biodiversity in a permanent ecological imbalance. Inventory has given the extent of wetlands degradation and used the information to manage them. This means that urgent solutions are needed to conserve wetland biodiversity in Yemen, as well as in other regions of the world; these should be found primarily through strategic action planning, both on national and local levels. The purpose of inventory wetlands is to identify the different types through specific analysis. The research was focused on geospatial information, which provides a global understanding of the classification and general physical functioning of these ecosystems. The result helps the Yemeni government initiate a process of sustainable development of wetlands.

Keywords: Classification, Inventory, Coastal Wetlands, Watersheds, mapping, Yemen

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Reproductive biology of sardinella sp. (Sardinella aurita and Sardinella maderensis) in the South of Morocco

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The reproductive biology of round sardinella, Sardinella aurita Valenciennes, 1847, and flat sardinella, Sardinella maderensis Lowe, 1841 was studied for the first time in the south of Moroccan Sea. Sardinella sp. has gained much attention lately because of its biomass increase, which might be the result of climatic changes occurring across the Atlantic Sea. Monthly samples were collected during the period between February 2015 and January 2016. Sardinella sp. is a gonochoristic fish. The overall female to male ratio was not statistically different for both species ($\chi^2=0.68$ for S.aurita and $\chi^2=1.04$ for S.maderensis), although it varied seasonally and according to the length of the fish. The monthly changes in the gonadosomatic index and the macroscopic characteristics of gonads showed that round sardinella in the south of Morocco spawns between February and July and between November and December but with a spawning peaks on April, for the flat sardinella it spawns between February and March and in July with a spawning peaks on July. Females round sardinella reach first sexual maturity at a smaller total length than males (26.17 and 26.78 cm respectively), concerning the flat sardinella it was the opposite, males reach sexual maturity smaller than females (20.75 and 21.76 cm respectively). In general, the reproductive characteristics of sardinella sp. in the south of Morocco differed when compared to stocks from other areas of its distribution.

Keywords: Sardinella aurita, Sardinella maderensis, reproduction biology, South of Morocco, gonadosomatic index
Biodiversity of benthic macroinvertebrates and multiparametric analysis of their distribution patterns in semi-arid water streams of northern-east of Algeria

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This study aims to enrich the knowledge of the biodiversity of aquatic macroinvertebrates communities in the Algerian northern east region; in semi-arid bioclimatic stage. We described and analyze biodiversity and distribution patterns of benthic macroinvertebrates, in relation to environmental factors. This work is carried to highlight the biological quality and health status of four stream waters of the Park of Belezma NPB, Batna (Biosphere Reserve). We identified in twelve sampling sites, 28 genera/species spread over 3 phylums, 5 classes, 11 orders and 23 families. A total of 15 species/genus were newly reported for the NPB. Taxonomic component of the enumerated communities is less diversified and unique to arid regions, The self-organizing maps ‘SOM’ analysis was used to study the distribution modalities of benthic macroinvertebrates. It was conducted with a multiparametric consideration, including a set of parameters; not only by their population abundance, but also with their location (altitude, longitude, latitude); the physicochemical parameters of water (12 parameters); and their habitat types (flow velocity, substrate coverage, anthropogenic pressure). This analysis shows three cluster groups formed by the models corresponding to the above environmental considered parameters. Globally, the distribution patterns in the arid regions follow those described in the tropics and in the Mediterranean region, including Europe. The distribution of faunistic groups shows that they will have more or less resistant to environmental conditions. This demonstrates the particular ecological requirement (life traits) of these organisms to tolerate the water quality, the substrate type and certain anthropogenic disturbances (pollution, drought).

Keywords: Macroinvertebrates, Stream water quality, Multiparametric analysis, arid area, Belezma National Park, Algeria.

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Population dynamic of cirriped crustacean Pollicipes pollicipes, among both seasons: Summer and Autumn in the Moroccan Atlantic Coast

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The fisheries environment has been subject of increasing pressure of the industrial and human activities, whose effects were quickly felt in many species that are considered as biological indicators of value and information such as some cirripeds crustaceans: Pollicipes pollicipes (Goose barnacle). Those represent important coastal resources for population livelihoods and coastal ecosystems. Yet, they are informally exploited despite several ministerial decrees that regulate their exploitation. Which involves various scientific studies to support the implementation of a development plan.

Goose barnacles live on wave-beaten rocky substrates in the intertidal and low-shore zones on the coasts. Those zones are more susceptible to be affected by phenomenon such as temperature increase and the raise of sea level caused by the climate change.

Accordingly, considering the current concern for the conservation of the coastal resources, we carried out a monthly monitoring program, within our larger scale study on the population dynamic of P. pollicipes, among both periods: harvesting season (Summer) and biological recovery period (Autumn), at two exploitable areas: Mansouria and Souiria Kdima.

This present work is about the study of population size structure, density and biomass of the different populations. The results obtained show that goose barnacle’s abundance and biomass differs between the seasons and from one site to another due to the biotope features: the density of Mansouria’s population is over 50% higher than Souiria Kdima’s. The results show also that the mean RC size is about 16.78 mm in Mansouria while it’s 15.32 mm in Souiria Kdima.

Keywords: Pollicipes pollicipes, conservation, intertidal biodiversity, population dynamic, mapping

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Check-List of Fish Availability in the Abid River, Morocco

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The fish inventory of moroccan continental waters allowed establishing a list of 50 species among which 35 natives and 15 non natives, divided in 28 genera and 16 families. This ichthyofauna is characterized by the predominance of the family Cyprinidae. The study of the ichthyofauna of the basin Abid River, one of the principal affluent of Oum Rbia River, aims to complete this inventory and to present a first reference document. During December 2015 to August 2016, samples were accumulated fortnightly by electrofishing in different points of the river. The present study revealed 11 species of fish under 3 orders and 3 families. Cyprinidae was the most dominant families representing 72.7% of the fish population followed by the Centrarchidae 18.2% and Anguillidae 9.1%. Among the available fish species, 36.36% are non natives and 63.64% are natives among which 71.34% are endemic. The Abid River basin undergoes several threats including the agricultural development, the degradation of water quality and the destruction of habitats such as fish spawning grounds. At the end of this study, and in order to maintain the diversity of the fish fauna, urgent and adequate management measures are proposed for its safeguarding and to allow a sustainable environment.

Keywords: Fish availability, Abid River, Conservation, Threats

*Speaker
Fecal peril problem in Morocco: case of wastewater irrigation area of Marrakech

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Diseases of fecal peril are a major public health problem. Many biological pathogens, such as viruses, bacteria, protozoa and helminth, are present in human and animal faeces. In Morocco, wastewater irrigation, limited access to drinking water, deficiencies in sanitation and food hygiene may facilitate the transmission of excreta-related diseases. In addition, epidemiological surveys, show that *Ascaris lumbricoides* (the human roundworm), *Trichuris trichiura* (the human whipworm), and *Ancylostoma duodenale* (the human hookworms) are the most prevalent species. Fecal peril diseases are considered as few important because they are rarely an exclusive reason for consultation.

The objective of our study is to determine the extent of the fecal peril problem in the Marrakech region, through the identification of parasitological agents present in the environment. The various elements of the environment (water, soil, crops, etc.) have been taken along the raw sewage dump from the sewage treatment plant in the city of Marrakech to the localities of "Harbil" in the north and El Azouzia (Fillala) in the west; where raw sewage is used for irrigation. The parasitological analyzes were carried out according to the standard diphasic method of Bailenger recommended by the WHO. As results, a large number of infectious agents were identified, with a high risk of diarrheal diseases for the local population. According to WHO, these diseases are the second leading cause of death in children, so, preventive measures are needed, with emphasis on health education and adequate treatment of wastewater.

**Keywords:** Fecal peril, parasitology, Diarrheal disease, Morocco

*Speaker*
Dietary overlap between foxes (Vulpes vulpes) and domestic cats (Felis silvestris catus) in urban and suburban areas.

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With the spread of urban environments many species have changed their trophic behavior, this response being particularly noticeable for mammalian carnivores. How carnivores are influenced by living in urban or environments needs comparative studies with other habitats, such as rural or wild areas. Here, we assess diet breadth and overlap in two habitats, an urban park and agricultural area of two common and generalist carnivores: the red fox Vulpes vulpes, and the domestic cat Felis silvestris catus. Foxes consumed mainly invertebrates and plants (fleshy fruits) in the urban park, while small mammals, birds and plants were eaten in the agricultural area. There was no difference in diet of foxes among seasons. However, foxes consumed rodents in different proportions between sites. In the agricultural area, cats consumed preferentially small mammals all year round. Reduced number of cat scat samples made impossible the analysis of diet in urban cats. In the agricultural area, cats had higher dietary breadth than foxes. Diets of foxes and cats overlapped almost completely. Despite their extensive dietary overlap in agricultural area, foxes and cats can coexist in this habitat in relation with abundant resources. First results of population size indicate that both predators are at very low numbers. Anthropogenic factors as hunting, habitat fragmentation and so on, can also play a role in the composition of this predator community. To more entirely understand the competitive interactions between foxes and cats will require examining their population dynamics in relation to prey availability.

**Keywords:** urban diet fox cat

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Influence of past and current landscape structure on species richness of plant communities of road-field boundaries

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Over the last decades, agricultural landscapes have experienced substantial land-use changes. Current landscape composition and configuration are known to influence the taxonomic structure of plant communities of road-field boundaries, i.e. the linear vegetation established between roads and arable fields. In contrast, although much less studied, past landscape context could also partly explain communities currently observed in moderately disturbed landscape elements due to a time-lagged response of species, for instance via seed persistence in the soil seedbank. Our study was conducted to assess the relative influence of past and current landscape structure on diversity of current plant communities of road-field boundaries.

For this purpose, we sampled the berm, the embankment and the field margin in 190 road-field boundaries located in Central-Western France, and characterized both past and current landscape structure within circular buffers of different sizes. We used a model averaging procedure to investigate the influence of components of landscape composition (the proportions of grassland and woodland) and configuration (the edge density) on the species richness of road-field boundaries.

The species richness of elements of road-field boundaries was better explained by past than present landscape structure. Moreover, the species richness of berms, the outermost element of the boundary presenting the highest proportion of perennial species, was better explained by the landscape structure than the species richness of the inner-field margin, although both increased with the proportion of woodland and the edge density.

Our results suggest that plant communities of road-field boundaries present a time-lagged response to landscape changes.

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Keywords: road, field boundary, field margin, landscape changes, species richness, time, lagged response, landscape composition, landscape configuration, edge density, proportion of grassland, proportion of woodland, proportion of cropland
Genetic pattern of the population of Cyanoderma erythropterum and Mixornis gularis in the fragmented Singapore landscape

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Habitat modification and fragmentation associated with human population increase and development are thought to be one of the main reasons explaining the recent high increase of species extinctions. Fragmentation and habitat modification divide original populations into small sub-populations. Depending on the distance separating patches and the species tolerance level to the matrix between patches (such as open areas), those subpopulations can be completely isolated from one another. Due to its extensive loss of natural habitat and biodiversity, Singapore is a particularly interesting study case, thought to be representative of the future global situation expected especially for Southeast Asia, which shows the highest deforestation rate observed among tropical regions. Since the 19th century, Singapore’s landscape has been extensively modified due to intensive deforestation and urbanization. Today primary forest and secondary forest represent only 0.2% and 4% of total area, respectively. Understorey species, such as babblers, being more sensitive to and more rapidly affected by habitat modifications, are an ideal model to study the effects of those modifications. Using genome-wide sequence data, we studied how fragmentation affects gene flow and connectivity among sub-populations to determine species dispersal capabilities and ecological characteristics that may influence susceptibility to extinction. We here present the genetic pattern of the population of two babbler species with different ecological requirement in the fragmented Singapore landscape. Cyanoderma erythropterum forest specific restricted to one reserve and Mixornis gularis highly edge-tolerant wide spread across Singapore.

Keywords: gene flow, connectivity, fragmentation

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Diversity and efficiency of wild pollinators of the medicinal plant (Asphodulus microcarpus).

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Bees contribute to the biodiversity of plants and food safety. This study concerns the bioecology of wild bees associated with the medicinal plant Asphodelus microcarpus in the natural environment. The investigations are carried out at the National Park of Theniet El Had (Algeria) in three localities: Guerouaou, Rond-point and Fersiouane during the period from April to June 2015. A total of 2546 specimens were captured, represented by 224 species of wild bees present in the study areas. The wild bee fauna recorded is distributed among five families and 23 genera. An important diversity is noted for the family of Apidae, with Twenty-two new species for the fauna of wild bees in Algeria. The maximum taxa are observed in May coinciding with the flowering of most plants. The density and diversity of bees are different from one station to another, depending on climatic factors and the availability of plant resources. The Asphodelus microcarpus plant is the most visited by wild bees with 46.67% of the total number of visits.

Keywords: Bioecology, Apoidea, Asphodelus microcarpus, P.N.T.H.

*Speaker
SCREENING LENTIL (LENS CULINARIS SSP CULINARIS) FIGS SUBSET FOR TOLERANCE TO TERMINAL HEAT AND DROUGHT STRESS

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Lentil (Lens culinaris Medikus) is one of the most important cool season food legume crops. It plays a major role in alleviating malnutrition and micronutrient deficiencies in developing countries. Terminal drought and heat are most abiotic stress affecting lentil production especially in the dry and semi-arid regions such as Morocco. We evaluated a FIGS set of 200 lentil accessions in alpha design with two replications at Marchouch experimental station in Morocco under three different temperature regimes normal planting: late planting with irrigation; late planting without irrigation. Observation were recorded on plant height, days to 50 % flowering, days to 95 % flowering, number of primary, second, tertiary branches, grain yield, filled and unfilled pods, 100 seeds weight and plant biomass. The results indicate that heat and drought stress at reproductive stage adversely affected plant height, number of primary, secondary and tertiary branches, total number of pods and seed yield. It also shortened the duration of pod filling by accelerating the forced senescence and the maturity. The developed heat and drought tolerance index (HTI and DTI) demonstrated a positive highly significant correlation with seed yield. Based on HTI and DTI, we have selected tolerant lines to heat and drought stress. ILL 4902, ILL 7833, ILL 729 and ILL 6338 were classified as highly tolerant lines to heat. However, ILL 880 was identified as highly tolerant to drought stress. Two lines (ILL 7835 from Nepal and ILL 6075 from Pakistan) have demonstrated tolerance to both heat and drought stresses.

Keywords: Lentil, heat/drought tolerance, heat tolerance index, drought tolerance index

*Speaker
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Growth and reproductive biology of anchovy, Engraulis encrasicolus (Linnaeus, 1758) in the region of Essaouira

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Among the fisheries potential in Morocco, pelagic fish resources are the most abundant available biomass. Fishing focuses on anchovies, sardines, mackerel and sardinella. The aim of the present study was to study the reproduction, age and growth of the species of anchovy, Engraulis encrasicolus (Linnaeus, 1758), necessary for the evaluation of its stock and understanding of its dynamics population.

The age, growth and reproduction of anchovy, Engraulis encrasicolus (Linnaeus, 1758) were determined from samples (N = 626) collected in the region of Essaouira during the year 2014. The fork has varied between 10 and 17.5 cm and the Von Bertalanffy growth function, fitted to age-length data showed for males and females respectively results \( L_\infty : 17.52; 17.53 \) cm and \( K: 0.66; 0.69 \) (yr-1). According to the size-weight relationship, the anchovy of the region of Essaouira has a growth isometry, the allometric coefficient \( b \) being equal to 3. The average sizes of the first sexual maturity corresponding to the point (L50) are 10.84 and 10.70 cm respectively for males and females.

The maximum age of anchovy in this region does not exceed 2 years. The sex ratio is in favor of females (46% males and 54% females). The average gonado-somatic ratio (RGS) of males and females increases in parallel. Anchovy can reproduce throughout our study period with a main spawn between June and August.

Keywords: Engraulis encrasicolus, sex ratio, gonad index, length, weight relationship, age, growth.

*Speaker
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Biological Study of the Louisiana crayfish (Procambarus clarkii) after its introduction in the Gharb plain, Morocco

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The Louisiana crayfish Procambarus clarkii is a freshwater crustacean from North America. Due to value as a dining delicacy, it was introduced into Morocco and several other countries for human consumption. The species is known to be extremely adaptable, establishing stable populations to the point of becoming an invasive species of high concern. Thus, its population, extremely dynamic, enabled rapid dispersion through the Moroccan wetlands. This study was designed to learn more about the bio-ecological characteristics of the species, using biometrics, population data and a variety of ecological parameters measured in two Moroccan populations of Louisiana crayfish (Procambarus clarkii Girard, 1852). Samplings were carried out in two types of areas: 1) canal Nador and 2) Merja Zerga in the Gharb region. Specimens of both sexes (males and females) were collected during the year. The study was conducted monthly and the samples were analyzed for color, sex, weight, length and sexual maturation. The results of this study show the extension of its propagation.

Keywords: Biology, louisiana crayfish, Canal Nador, Merja zerga, Morocco

*Speaker
Comparative analysis of the parasitic fauna of two species of patellogastropoda of the genus Nacella.

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The Antarctic (A) South-Antarctic (SA) connection can be understood through the biogeographic history of the Southern Ocean (SO). Evidence of this connection are closely related species in both environments like the patellogastropod genus Nacella. These true-limpets are dominant macro-invertebrates, inhabiting ice-free rocky intertidal of these ecosystems. Nacella exhibit narrow bathymetric ranges and therefore the possibility of deep-sea connectivity is overruled. The time of divergence between A and SA species of Nacella has been estimated at around 3 Ma suggesting that the Antarctic Circumpolar Current (ACC) represents an effective barrier to the gene flow. Parasites need to live inside or on another living organism to survive and develop. Nacella are intermediary hosts in the life cycle of many parasites species. In this study, I compare the parasite-fauna composition between Nacella concinna (A) and N. deaurata (SA) to understand the current patterns of diversity and connectivity in these organisms in both environments. Three scenarios are postulated: (1) If the definitive host is a long distance migrant between A and SA, then both species could share at least one parasite species, (2) If A is a closed environment with an endemic fauna without connection with SA, then both species could have different parasite-fauna, and (3) If both Nacella species have highly specific parasites, they should follow the biogeographic and evolutionary history of their hosts. This work is the first intent to reveal the strength of the ACC as barrier to parasites and to understand the evolutionary history of these organisms in the SO.

Keywords: Antarctic, South, Antartic, Parasites, Biodiversity

*Speaker
Ectoparasites of Scorpionfish collected from Tunisian coasts off the Mediterranean Sea

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A parasitological survey of 841 Scorpionfish belonging to three species (259 Scorpaena scrofa, 276 Scorpaena porcus and 306 Scorpaena notata) caught among Tunisian coasts, were examined for an eventual ectoparasites infections, from October 2014 to November 2015. Fish were dissected and were examined under a binocular microscope. Nine ectoparasite species representing four taxonomic groups were recorded: Monogenea (Microcotyle algeriensis), Copepoda (Strabax monstrosus), Isopoda (Ceratothoa oestroides, Nerocila bivittata, both Male and female of Anilocra physode, male of Mothocya nana, Praniza larvae Gnathia sp.), one species of Ostracoda (Cypsridina sp.) and Annelida (Trachellobdella lubrica).

The highest prevalences were recorded in: Cypsidina sp. infesting the buccal cavity of S. scrofa (P=51%), Strabax monstrosus from the gills of S. notata (P=49%) and Praniza larvae Gnathia sp. from the buccal cavity of S. porcus (P=47%).

Morphology, host, site of infection, prevalence and mean intensity of each parasite found during this survey are reported.

Keywords: Scorpionfish, Ectoparasites, Isopoda, Copepoda, Ostracoda, Annelida, Tunisian coasts

*Speaker
Functionally rare species can support unique functions for ecosystems. Moreover, identifying the distribution and drivers of functional rarity across space and time is of tremendous importance for conservation ecology. However, functional rarity remains an overlooked facet of functional diversity.

We used a worldwide coral reef fish database comprising 2073 species occurrences in 259 locations with complete information for 6 traits related to major ecological functions as well as a phylogenetic tree of all those species. Functional Rarity is defined as the originality of a species given its neighbor in a community. For each species we computed functional rarity, evolutionary distinctiveness and geographic range indices.

We found that evolutionary distinctiveness of a species does not correlate with functional rarity. Species restrictedness in space and functional distinctiveness let us classify species in different categories: functionally rare or common & geographically restricted or widespread at a global scale. Our results show that the originality of a species by its traits cannot be estimated from its position in a phylogenetic tree. Our work also underlines the lack of IUCN assessments for functionally rare species. It could be used to prioritize species for which an assessment should be made.

**Keywords:** functional rarity, functional ecology, coral reef fishes, functional biogeography, rarity, biodiversity
Wild boar (*Sus scrofa*) is the most common wildlife species causing crop damage. However, their essential biological information is still rare in tropical Asia. We used 56 camera traps to monitor the sex-age related space use and activity pattern of wild boars from June 2012 to August 2016 in Nabanhe Reserve, southwest China. We found that different age class had different spatial use patterns: piglets preferred forest interior regions while adult males were active near the forest edge and villages, however, there was no evident preference for adult females and subadults. The monthly relative abundance for each age class exhibited a bimodal distribution pattern with one peak in May and another in September and October. In addition, wild boars exhibited a crepuscular daily activity pattern with little variations among ages and sexes. As such, controlling the adult male population during May and October within a year is the most direct and effective way to address crop raiding concerns. On the other hand, protecting piglets would have beneficial effects for rare carnivore species of conservation concern that are limited to reserve inner zones.

**Keywords:** wild boar, *Sus scrofa*, spatial use, activity pattern
The opening of the Suez Canal in 1869 led to the invasion of the Mediterranean Sea by an increasing number of Lessepsian fish species. This review of the Tunisian Erythrean migrants is based on information compiled from published literature until this date and unpublished own observations of the authors. A total of 28 Lessepsian fish species, representing 23 different families including 8 that are new for the Tunisian ichthyofauna, were counted along Tunisian coasts. Concerning their status, the majority were classified as alien (85.71%) while only 14.29% may be considered as established; indeed, the majority of these species were casual (78.57%) while a less percentage were common (21.43%). About their distribution, 46.43% of Lessepsian species were present, with the same percentage, in the North and the South regions and 3.57% in the Central region while 14.29% of them were observed along the entire Tunisian coasts. According to size ranges, 78.57% of the Lessepsian fish species were classified as medium and 21.43% as large. Tunisian non-indigenous species were found on sandy/muddy bottoms (28.57%), on rocky substrates (17.86%), on substrates covered with vegetation (10.71%), and 21.43% were reef-associated. A great percentage of these species were carnivorous (85.71%) and a less number were herbivorous (10.71%) while only 3.57% were omnivorous. Actually, only 7.14% of the species are recognized as commercial species. This updating of the Lessepsian fish spreading along the Tunisian coasts shows their accelerated increasing over time which may have repercussion on the local ichthyofauna on a short or a long term.

**Keywords:** Tunisia, central mediterranean, lessepsian, migrant fishes, ichthyofauna
Growing urbanization and agriculture intensification are major threats to biodiversity and ecosystem services worldwide. Energy availability is the basis of productivity and ecosystem functioning but it is reduced by intensification practices. However, few studies have examined the large scale response of the different components of biodiversity and functional diversity in particular to land use intensification. Using the French Breeding Birds Survey, coupled with a trait database, we investigated the variations in the functional structure of bird communities to several indicators of intensification as human appropriation of NPP (HANPP) and available energy (NPPeco), over agricultural and semi-natural landscapes. Specifically, we evaluated habitat specialization (CSI), average trophic position (CTrl), functional richness (FRic), evenness (FEve), divergence (FDiv) and dispersion (FDis) of these communities along a gradient of intensification.

Our results show that the facets of diversity respond differently to human appropriation. FRic, FDiv and FEve tend to decrease with NPPeco. Conversely, FDis tend to increase with NPPeco.

Habitat generalists with an intermediate trophic level dominate communities for intermediate levels of NPPeco, suggesting an ongoing biotic homogenization.

Overall, our results suggest that the impact of human appropriation highly varies across facets of biodiversity and ecological functions, highlighting the complex interactions between habitat, NPP and biodiversity.

**Keywords:** Birds, functional diversity, HANPP, intensification
Major threats that imperil insular ecosystems

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Islands are exceptionally rich reservoirs of biodiversity, despite covering only 5% of the global land surface. Around 50,000 to 70,000 vascular plant species are endemic to insular ecosystems. Most of these endemic species and ecosystems suffer from anthropogenic threats, affecting their environmental parameters and ecological integrity. These ecosystems are highly vulnerable compared to continental ecosystems due to species life history traits and communities properties. Therefore, we plan to characterize the past and current threats affecting island ecosystems. Firstly, based on the International Union for Conservation of Nature data, we determined the threats affecting 15 large, insular regions harboring 12,483 endemic species (including invertebrates, plants and vertebrates). First analyses reveal a spatial pattern of threats across the fifteen insular geographic areas and highlight co-occurrences between threats. Indeed, biodiversity of Pacific and Atlantic insular regions are mainly threatened by invasive alien species, except for the West Indies. The rest of insular regions, mostly located in Indian Ocean and near to the Asian coast, are predominantly threatened by biological resource use, agriculture and aquaculture. Respectively, biological resource use, agriculture and aquaculture and invasive alien species threatened insular endemic species. There is no significant difference between taxonomic groups. Following this, we propose to identify factors responsible of extinction risk in insular species by combining our dataset with species traits information (e.g. body mass, geographic range size). We expect that our results will help identify the insular geographic regions and communities most vulnerable to past and current threats, and thereby help prioritize conservation measures.

Keywords: Island, Global change, Endemic species
The leadership in different habitats and regions with different climate types of mixed-species bird flocks in southwest China

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Conservation biology is increasingly emphasis interactions among species such as mixed-species bird flocks facing anthropogenic disturbance. However, the fundamental question of whether the anthropogenic disturbance influences the leadership of flocks has as yet received less attention. This study focus on the questions that whether the habitats influence the leadership of flocks and, the flocks differences between different region in climate type. We used transect survey in three habitats (forest, forest edge, agriculture land) with various land-use intensity in both tropical and non-tropical area of southwest China. The results showed that the leadership varied among different habitats, and the body size is a significant impact factor of the differences between regions with different climate types (tropical area has less flocking birds and the body size of non-flocking birds are much larger than flocking birds). We suggest to adopt different protect strength according to different climate zones and to protect the leadership of the flocks for protect multiple bird species.

Keywords: leadership, mixed species bird flocks

*Speaker
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Development of sexual organs and fecundity of cuttlefish sepia officinalis (Linnaeus, 1758), in the southern Moroccan Atlantic

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Fecundity refers to the numbers of mature eggs produced by a fish at spawning. It’s an important variable to understand the life cycle of species and to determine the peak period of spawning assessment, exploitation of fish and biological characteristics. Knowledge of the sexual maturation process and changes in the ovaries and testes is vital and important to understanding the life cycle of any fish. So, this study provides a detailed description of the morphology and histology anatomy of reproductive system and gonads of cuttlefish sepia officinalis in the southern Moroccan Atlantic Sea. A total of 479 specimens collected between Mars 2013 and October 2014 was studied. Formation and development of spermatozoa and oocytes could be divided into; five stages of females (immature, maturing, pre-spawning, spawning and post-spawning) and four stages for males (immature, maturing, mature and post-spawning). The maturation stages was identified on the basis of macroscopic and microscopic observations of the reproductive system and linked with some reproductive indices. A correspondence between gonad appearance and its histological structure is observed. The Gonadosomatic indices in the two genders, revealed a peaked in spring and a spawning period in April. Data on the potential fecundity, oocyte and spermatophore size are reported and compared with literature. In addition, spermatophore components are also computed. The results reported in this study lead to easy identification of the different phases of sexual maturation of S.officinalis and could constitute an important tool for defining assessment models in view of sound management of this species.

Keywords: Fecundity, sexual organs, sepia officinalis, maturation stages, southern Moroccan Atlantic

*Speaker
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lantic
Digging deeper: Impact of large ungulate populations on soil ecology

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Introduced non-native species are altering the ecology of natural communities at an unprecedented rate, threatening the services they provide, and becoming another driver of climate change. On the Canadian archipelago of Haida Gwaii in 1878, non-indigenous Sitka black-tailed deer (Odocoileus hemionus sitkensis) were introduced, and in the absence of predators, deer populations have exploded, with detrimental impacts on native aboveground plant and animal communities. Knowledge on how deer affect belowground organisms and processes is lacking and needed, given the vital role soil organisms play in soil carbon storage and nutrient cycling and the consequent feedbacks to plant nutrition and growth. Deer may directly enrich soil through deposition of high quality litter and waste products. Conversely, their selective foraging increases the abundance of plants with lower quality litter, impacting soil productivity. To address these crucial questions we will compare soil organisms and processes between islands with and without deer and inside and outside deer exclosures. This study will fill a major gap in our knowledge about how introduced browsing mammals affect belowground processes. By quantifying the impact of deer and damage reversibility, it also aims to give clues for land-management strategies.

Keywords: deer, trophic cascades, aboveground belowground interactions, soil

* Speaker
Mitigating the impact of the tropical tuna purse seine fisheries on Silky sharks (Carcharhinus falciformis): small scale behavioral analyses and future improvements in the protocol for video data acquisition in the purse seine net

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Sharks are top predators in marine ecosystems. Due to their low fecundity and late maturity, they are considered among the most vulnerable species to human exploitation. Silky sharks (Carcharhinus falciformis) figure among the most frequent shark species that are accidentally caught in the purse seine tropical tuna fisheries worldwide. Juveniles are commonly attracted by floating objects together with tropical tuna aggregations. Possible mitigation measures that reduce the bycatch of silky sharks have been considered, among which the possibility to attract them out of the purse seine net. This research has been the first step towards assessing the key stimuli that may be employed in such conservation measures, by studying the behavior of silky sharks in the purse seine net at a fine scale. We analyzed the videos filmed in the net during three scientific cruises conducted in the Pacific Ocean in the period 2012-2014. We found indications of different behavioral patterns of silky sharks in the net that may guide future developments of mitigation measures. Swimming speed and distance between individuals in a group were found constant throughout all the cruises. Also, the results showed a bimodal distribution of group sizes that suggests that social interactions may play an important role in the spatial distribution of silky sharks. Other analyzed categories, like the attraction to the net, have shown a certain disparity among years, possibly caused by the

*Speaker
difference in sample sizes or bias while filming. What is certain is that there was a need for an established...

**Keywords:** Purse seine fisheries, silky sharks, bycatch mitigation, shark behavior
Ecological changes along the transition from annual crops to perennial plantations in Northern Thailand

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During the past decades, rapid land-use change and agricultural intensification led to serious environmental degradation in South-East Asia. In particular, the expansion of rubber tree plantations caused important biodiversity losses and an increase of erosion processes. Weeds fulfill various ecosystemic services in the agroecosystem: they support biodiversity at higher trophic levels and enhance soil stability and structure; but intensive weeding practices have been shown to strongly affect their communities. Thus, enhanced weeds management by farmers could be a cost-effective mean to favour biodiversity conservation and erosion control. We studied variations of weed communities and soil physical properties along 4 land uses (rice, maize, young rubber plantation intercropped with maize and mature rubber plantations) in Northern Thailand. We found that weed communities were specific to land use, and that the interactions between weeds and soil were dependant on the community composition. Further experimentation will allow us to better understand the effect of weeds on erosion control.

Keywords: Weeds, community, erosion, soil

*Speaker
Contribution to the study of daily attacks by grain-eating birds on the rice Rukoko locality in Gihanga commune, Bubanza province

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Our study is based on the counting of birds visiting our study area. We counted the birds from the rice heading stage until harvest. The counting has been done over six consecutive weeks from 11 February to 25 March 2013 at a rate of three times a week. Our study involved 30 rice plots extending over spanning 4320 m² with 144 m² for each plot.

Its specific objectives were to inventory the species of birds that frequent rice fields, to show, among the species of birds that visit the rice fields, those which come often from others and finally to highlight the daily traffic distribution of attacks. We verified also if the times of the day may influence visits by grain-eating birds. Finally, we analyzed the guarding efficiency using a single rice keeper non feeds.

The results show that thirteen species visited those fields. These are Euplectes orix and Euplectes axillaris, which are the most common, followed by Lonchura cucullata, Amandava subflava, Ploceus cucullatus and Lagonosticta senegala with an average frequency. These species Quelea quelea, Ploceus ocularis, Lanius collaris, Lanius excubitoroides, Chrysococcus caprius, Motacilla flava and Centropus superciliosus as for them are much more rare to frequent these fields.

The variance analysis has led us to audit our research hypotheses. Visits before noon differ from those of the afternoon. The use of a single rice guardian and not feeding is not effective.

After analysis and interpretation of results, recommendations were made to researchers, at the State and the rice farmers.

Keywords: birds, grain, eating rice, rice guardian

*Speaker
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Distribution and composition of plant communities at the base of alignment trees in an urban zone in 2014

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Many studies show how quality of biodiversity influences the well-being of citizens. Nevertheless, little is known about the drivers that shape it in urbanized zones. Tree bases occupy a much reduced surface area, but are present in great number and arranged deliberately through spaces. They could play an important ecological role in the urban context which offers limited favorable spaces for the development of spontaneous flora. Our objective was to determine the factors influencing composition and dynamics of spontaneous vegetation around street trees. We thus analyzed the data of floristic inventories growing at the base of 1474 trees in 26 streets in 2014 located in the district of Bercy in Paris.

Our results indicate that species richness and composition depended on the district scale (distance to green spaces), on the street scale, on tree base characteristics (tree base equipment), and on the plant biological characteristics (seed longevity in the soil bank).

The results of a software modeling metapopulation dynamics run on inventory data collected every year between 2009 and 2015 showed that for most of the species, tree bases were sinks for source populations growing in larger sites (e.g. parks) but for some other species, they also participate to the movement of species across the city (stepping stones).

This study showed that the tree bases are favorable habitats for a certain number of species and could be considered as corridors between more important green spaces like parks or gardens.
The results will define the best management plans for urban biodiversity.

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Keywords: Ecological role, metapopulation dynamics, species richness, spontaneous flora, tree bases, urban biodiversity, urbanized zones.
Biodiversity and population dynamics of wild bees in Tlemcen National Park (Algeria).

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There is increasing concern about the status and trends of pollinators across the globe. Pollinators play an important role for the functioning of ecosystems and are essential for crop production. However, they have suffered accentuated declines over the past century. Understanding the processes that have led to shifts in pollinator diversity is essential to develop better conservation measures that stop declines and restore pollinator communities. The present work concerns the distribution and the diversity of wild bees through three stations in the National Park of Tlemcen, following an altitudinal gradient. The study was conducted from April to June 2014. A comprehensive inventory of 155 species is established. These species are distributed among 21 genera and 5 families. The Apidae have the highest rate with 36% before the Andrenidae 21%, the Megachilidae 21%, the Halictidae 20%, and finally the Colletidae 2%. The study noted three new species for the bee fauna of Algeria. Those are *Andrena marginata* Fabricius, 1776, *Anthidium manicatum* Dallatour 1877 and *Megachile latimanus* Say, 1823. The diversity indices applied to results allowed to identify the composition of the fauna, its dependence on floral resources and its spatial and temporal distribution. The results reveal a strong wealth of Apoidea in the region where conservation is needed in the future as this fauna plays a key role in the pollination of plants and their diversity in natural and agricultural ecosystems.

**Keywords:** pollinators, wild bees, National Park of Tlemcen, floral resources, spatial and temporal distribution.

*Speaker*
Social dynamic patterns may trigger population structure in Iberian wolves

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Population genetic structure has traditionally been considered the result of well established behaviours (e.g. colonies), spatial restrictions or historical factors. Recently, natal habitat-biased dispersal and territoriality have been suggested has promoters of genetic partition in species such as wolves. A recent study showed that the Iberian wolf presents high level of genetic structure, with multiple geographic groups. One of these groups comprises packs present in Alto Minho (NW, Portugal), which has been the subject of an ecological and genetic monitoring program since 2007. We profited from this long-term project to investigate whether genetic structure is related to social dynamics of the packs. Thus, we aimed to reconstruct the recent genealogical history of packs and understand the dynamics of pack formation and maintenance in Alto Minho. Sampling comprises 1250 scat samples collected throughout 9 years, across the territory of six different packs. Based on the amplification of 19 microsatellites, we were able to identify 165 individuals. The genealogy of 5 packs was reconstructed, comprising more than 50% of the sampled individuals. Breeding pairs were formed by unrelated individuals and were the same over the monitoring period. Two different breeding pairs were observed in one pack before 2009, though we have no evidence that it happened simultaneously. This results show a clear evasion to consanguinity, but also that natal habitat-biased dispersal is common in Alto Minho, providing a first explanation for the observed genetic structure in Iberian wolves.

Keywords: Wolves, population genetic structure, relatedness, dispersion

*Speaker
Deadwood is the main driver of bird and bat communities in strict forest reserves

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Sustainable forest management aims to produce wood while preserving habitats for biodiversity, which is particularly challenging for vertebrates with local and landscape scale requirements, such as birds or bats. Managers need additional scientific evidence to help them balance conservative and integrative management methods. In this study, we evaluate the relative influence of management abandonment, stand structure and landscape features on bird and bat communities in 14 managed and unmanaged forests in France. Total birds and bats richness, richness for forest and threatened birds and edge-specialized bats significantly increased with total deadwood quantities. Richness of generalist, omnivorous and cavity-nesting birds was higher in unmanaged stands and richness of gleaning bats were positively influenced by the density of standing deadwood. Landscape variables had surprisingly little influence on the different ecological groups. Though the effects showed relatively limited magnitude, our study supports the value of deadwood and the importance of management abandonment for forest vertebrates. However, further analyses are needed to better understand the ecological role of deadwood as substrate provider. To be fully efficient, conservation strategies must be complemented by designating strict forest reserves because some target species groups depend on structural features found only at sufficient levels in those areas.

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Keywords: forest management, strict forest reserve, deadwood, species richness, birds, bats
Forest fragmentation in the Asian tropics: a model study from a fragmented forest landscape in southwest China

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Aim: Forest fragmentation is a major threat to biodiversity, but few studies have been conducted in the tropical Asia region. Here, we studied how a recent fragmentation (~30 years) affected the biodiversity of tropical forest in southwest China.

Method: In 2012, we established the forest fragmentation project in Xishuangbanna, Yunnan, China. Studies were conducted for plants (trees, lianas and herbs), birds, herpetofauna, mammals, and insects. We also used re-sampling method, GIS techniques, camera trapping, barcoding and collected several site properties.

Result: Forest cover of the study area decreased by 50-60%, with most of the remaining forest patches situated along steep slopes, poor soils and sunny aspects. Site variables explained more than fragmentation variables, meaning the forest structure is still adapted to the past history of the landscape. Nevertheless, the effect of fragmentation cannot be ignored as we found 34% of bird has been extirpated, mostly frugivorous birds; reduction of big-seeded-mammal-dispersed trees; compositional changes between smaller and big patches and along plot distance to forest edge; and varied species assemblage between forest and rubber/tea plantations. Moreover, the effect of fragmentation can be better detected when analysis is conducted at community level than looking at the whole landscape.

Synthesis: Our first 5-year study found substantial evidences on the effect of forest fragmentation. These results can aid conservation-decision making by determining protection-priority forest patches and developed fragment connectivity, and the need to stop forest conversion to rubber plantation. This study can also be a research model for more fragmentation studies in the Asian tropics.

Keywords: edge effect, forest fragmentation, patch size effect, tropical Asia, Xishuangbanna

*Speaker
Coming of garden birds in winter: impact of surrounding agricultural landscape

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The link between agricultural changes and bird population declines is well documented and investigations often focused on reproductive success. However, few studies investigated on survival and especially on winter although changes in practices make winter bird survival even harder, chiefly for seed-eating passerines, by reducing seed availability. Nevertheless, more and more people supply birds with food in their gardens so we expect those gardens to play a major role in maintaining populations by acting as havens, notably in an intensive landscape. Using for the first time the French Garden Birds program (a national citizen science program), we crossed bird winter counts with an agricultural intensity indicator (the Input Cost per hectare index - ”IC/ha”) to study the link between the coming of birds in gardens and the intensification of surrounding landscape. We found differences in phenology of visiting. In fact, the arrival of birds in gardens is faster in intensive landscapes. Furthermore, we found an interaction between the species degree of dependence to agricultural landscape and the IC/ha indicator. The arriving in intensive landscape is even faster for the more dependent birds. As some seed-eaters were recently placed on the French IUCN Red List of species of conservation concern, these results provide a glimpse of hope by suggesting that food supply, in winter in gardens, is not only a recreational activity but attracts seed-eaters and could help to improve their survival during the cold season, chiefly in an intensive landscape.

Keywords: Garden birds, winter, supplementary feeding, citizen science, agricultural intensity

*Speaker
Modeling the direct and indirect effects of copper on phytoplankton–zooplankton interactions

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Predicting the effects of pollution on community is difficult because of the complex impacts of ecosystem dynamics. To predict the effects of copper on plant-herbivore interaction in a freshwater ecosystem, we built a model that focuses on the interaction between an alga, *Scenedesmus* sp., and a herbivore, *Daphnia* sp. Internal copper concentrations in *Scenedesmus* and *Daphnia* are calculated using a biodynamic model. We include two types of direct effects of copper on *Scenedesmus* and *Daphnia* that results from hormesis: a deficiency effect and a toxic effect. We perform a numerical analysis to predict the combined effects of copper and nutrient enrichment on the *Scenedesmus–Daphnia* interaction. Results show three types of outcomes depending on copper concentration. First, copper may lead (1) to the extinction of all populations, (2) to only the extinction of consumer population, and (3) to the survival of the two populations. Second, copper has a stabilizing effect by reducing or suppressing oscillations. Third, copper opposes the destabilizing effect of nutrient enrichment. Our model shows that (1) *Daphnia* is more sensitive to copper when community interactions are taken into account than when analyzed alone and (2) counterintuitive effects may arise from the interaction between copper pollution and nutrient enrichment. Our model also suggests that single-value parameters such as NOEC and LOEC, which do not take community interactions into account to characterize pollutants effects, are unable to determine pollutant effects in complex ecosystems. More generally, our model underscores the importance of ecosystem-scale studies to predict the effects of pollutants.

**Keywords:** Ecotoxicology model, Predator Prey interaction, Copper, Eutrophication, Daphnia, Scenedesmus

*Speaker*
Evaluation of agromorphological variability of Argan tree.

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Argan tree is a multipurpose arborescent species of great socio-economical interest for Morocco, especially the south western part. It is used for people nutrition and live stock, as well as medicine and cosmetics. Besides protecting the environment against desertification and erosion it produces wood for various end-uses. The natural stands, in constant reduction since the 19th century, are more and more threatened by anthropomorphic pressures, hampering the natural regeneration of the species.

In the purpose of preserving and understanding the evolution of this tree species, a study of the influence of environmental conditions on the morphology was carried out on different ecotypes of Moroccan Argan genotypes.

This study is based on surveys and collections of Argan genotypes as well as on the analysis of climatic and soil factors (temperature, rainfall, altitude, soil components ...).

Genotypes were evaluated by agromorphological descriptors, including observations in the collecting sites and characterization in the laboratory for qualitative and quantitative traits. A germination test was carried out on seeds of selected genotypes. The results showed high germination rate with adapted protocol.

Identification of diversity and adaptability of *Argania spinosa* genotypes is a first step in wild species selection and breeding approaches. The results presented in this study are preliminary and constitute part of a research program on the Argan tree.

**Keywords:** Argania spinosa, agromorphological descriptors, genotypes, breeding

∗Speaker
Spatio-temporal evolution of thermal niches in lacertidae lizards in extreme environments in the Central High Atlas of Oukaimeden

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This work falls within the broader context of work on the evolution of thermal niches lizards Palearctic. This approach requires selecting species directly sensitive to environmental conditions (resources, climate) and then have a special indicator position in the ecosystem. To perform this, we worked on the species of Lacertidae lizards in the Central High Atlas Oukaimeden and focused to clarify the climate sensitivity and thermoregulation strategies in these sympatric species in different biogeographic affinities. We performed measurements of body temperature in the wild and in the laboratory, and we identified the temperature and humidity of caractéristiques microhabitats and we estimated the loss of water through evaporation rates. The statistical analysis show no significant differences between these Lacertidae, and Atlantolacerta andreanszkyi owns the water loss rate highest evaporative. These key information can be the basis for understanding the response mechanisms of living organisms to global changes.

Keywords: Lacertidae, Biogeography, thermal preference, water loss, extreme environment, Oukaimeden.

*Speaker
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Climate changes and biosynthesis of fungal metabolites affecting the physicochemical and microbiological quality of dairy products in Morocco

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Microorganisms develop their resistance in response to climate changes by changing their metabolic pathways in order to persist in unusual ecosystems. Our study focused on 15 parameters (6 microbiological and 9 physicochemical) that are part of the regulatory requirements. It was possible to carry out a study of the evolution (kinetics) of each parameter, a study of the variation and finally a study of the interaction between the various parameters. All these studies showed a high criticality of contamination with mycotoxins and of the fat content. Contamination of the dairy chain by mycotoxins appears to have a very close link with climate change, especially after a statistical study on meteorological data. This variation influences the operational process of forage preparation (silage) and promotes not only the fungal development but also the biosynthesis and the secretion of the mycotoxins. In addition it increases the number of contaminated lots by 25%. This involves current agricultural engineering that require a new approach that takes into account the principles of climate change adaptation. Fluctuating dairy quality is caused by the seasonal variation in milk quality (low and high lactation) but also by variation due to periods of drought and cold (extreme climatic events). Among the factors most vulnerable to these changes is the fat content. that directly affects the efficiency of sterilization of heat-treated dairy products. The accidental decrease of the fat content to less than 21.5 g essentially causes a non-decontamination of the fresh cheese for example.

**Keywords:** Climatic changes, mycotoxins, quality, dairy products
Community analysis of leaf litter-ants in forest fragments and rubber plantations in Xishuangbanna, Yunnan

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Assessment of biological diversity across different natural and anthropogenic habitats is fundamental to current global conservation efforts. Ants play important roles in ecological processes and are suitable as indicator species for assessing changes in habitat conditions and quality. Here we have investigated effects of forest conversion to rubber plantation on litter-dwelling ants in Xishuangbanna, Yunnan province. We compared species richness, diversity and community composition of litter-ants between forest fragments and adjacent rubber plantations. We collected a total of 1,562 ants representing 58 morphospecies. Ant species richness and Shannon-Wiener diversity index were significantly lower in rubber plantations than forest. In addition, species richness and diversity index were significantly and positively correlated with litter-depth in both rubber and forest. Litter depth exerted much stronger effect on species richness and diversity of litter ants relative to land use type. NMDS and ANOSIM analysis indicated that ant community composition was significantly different between rubber and forest, and the community dissimilarity among rubber plantations was larger than that of forests. We found four species that were significantly more common and abundant in forest fragments, whereas no such species was found for rubber plantations. In addition, we found greater abundance of "opportunist" group in rubber plantations. Our results showed that rubber plantations provide habitats for only generalist and opportunistic species and unsuitable to sustain biodiversity compared to forests. Thus, our study suggest that ongoing forest conversion to rubber plantations will adversely affect biodiversity in Yunnan.

Keywords: leaf litter, ants, forest fragment, rubber plantation, species richness, species diversity, community structure, Xishuangbanna
Valorization of phytogenetic resources of wild beet in Morocco

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Biologically cultivated Beets are recently developed species. They are the results of human genes manipulations. Thus, beet genetic resources still have major importance as source germplasm for breeding programs and cultivated beet varieties production. This research aims to characterize moroccan wild beet populations and species of Morocco and to study the heritability of characters through interspecific crosses between sugar beet and beet wild populations. In the present investigation, a set of 66 beet genotypes resulting from five different crosses between Beta maritima and cultivated Beta vulgaris (Cr1, Cr2, Cr3, Cr4 and Cr5) were studied and compared within and between generations. Results showed successful crosses between the two forms of wild and cultivated beets with a yield per plant ranging from 50 to 80%. Indeed, the analyzed genotypes revealed a low level of genetic diversity compared to their wild relatives. Leaf traits (length, width and petiole of the leaf blade and pigmentation) were very similar to wild genotypes, especially for Cr4 cross. The flowering period of wild populations is coincided with Cr1, Cr4 and Cr5 crosses. Cr1 was the best crossing that has inherited the most of phenotypic characters from cultivated parents. Results showed a success of over 80% crosses. Evaluation based on morphological and genetic traits showed a difference in inherited characters between the crosses according to the parent genotypes. The encouraging results of interspecific crosses of evaluated germplasm shows that the Moroccan collection is of great interest for interspecific breeding programmes, diversity enhancement and genes of interest introgression to cultivated beet.

Keywords: Interspecific crosses, beet populations, inheritance, collection, Beta maritima, wild beet.

*Speaker
Heavy-Metal Concentrations in free living rodents from Merja Zerga in north Morocco: Importance of Species- and Location-Specific Characteristics

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Heavy metal content was monitored in small mammals inhabiting agricultural fields and forest of Merja Zerga in North Morocco. Rodents (Mus spretus, Mus domesticus, Gerbillus campestris, Rattus rattus and Rattus norvegicus) were used as bioindicators to examine the effects of metal pollution. Five heavy metals: Cu, Cr, Pb, Zn and Fe were quantitatively analyzed by atomic absorption spectroscopy Varian AA 240 with graphite furnace in various organs.

The highest concentrations of these trace elements were detected in the liver, followed by the kidneys and the heart. The highest concentrations of Pb, Cu, Fe and Cr, Zn were found in the liver of Rattus norvegicus and Gerbillus campestris, respectively. Medium and low levels of contamination were detected in Mus spretus and Mus domesticus respectively. The results suggest that the genus Rattus and Gerbillus can be considered as a bio-indicator that accumulate more trace-metals than the genus Mus. We also investigated the species-response models to some heavy metals.

Keywords: Heavy metals, Rodents, Merja Zerga, Bioindicators
Spatial and vertical distribution of benthic communities in habitats frequented by shorebirds at Merja Zerga Lagoon, Moroccan Ramsar Site.

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Merja Zerga lagoon is a wetland of international importance for birds, located on the north-Atlantic coast of Morocco. It is a place of wintering, stop-over migration and reproduction of a large contingent of shorebirds. The diversity, abundance and distribution of these birds within the site are strongly related to the size of its mudflats and their richness in benthic macroinvertebrates which are prey of choice for these birds.

The aim of this study as a first step is to analyze the structure and spatial organization of macrobenthic fauna, in function of some mesological parameters and secondly to evaluate the importance and the vertical distribution of the fraction of the benthic macrofauna available to waders.

A total of 46 macrobenthic species were identified. The polychaetes, molluscs and crustaceans dominate the species richness, density and biomass of this community. The analysis of the results showed a strong spatial heterogeneity of the distribution of benthic macrofauna. The hydrological and sedimentary parameters as well as the presence or proximity of a seagrass are the main components that govern the structure and functioning of these communities. The vertical distribution showed a marked vertical stratification of the benthic population in terms of their species richness, density and biomass. The results show the importance the first slice located at the sediment-water interface in the functioning of the benthic ecosystem.

A mapping of the distribution of these macroinvertebrates can help managers of this wetland to identify functional zones with strong conservation issues for preservation of birds.

Keywords: Merja Zerga lagoon, macroinvertebrates, microdistribution, mesological parameters, avifauna.

*Speaker
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Surface water availability and cattle herding practices shape the human-wildlife interface at the edge of a protected area

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Coexistence between wildlife and human activities is increasingly perceived as a key to successful conservation, yet the underlying mechanisms remain unclear. We investigated the environmental and human drivers of interactions between livestock and wild herbivores at the edge of an unfenced protected area. We used GPS data to quantify avoidance between African elephant, African buffalo and cattle at multiple scales, at the edge of Hwange National Park, Zimbabwe. Cattle, elephant and buffalo share a preference for open grassland habitats found close to water. However, cattle return to their home-kraal daily and incursions in the protected area are thus limited to a few kilometers from the boundary. During the rainy season, when resources are abundant, buffalo predominantly rely on avoidance at the home range scale whereas the home ranges of elephant and cattle largely overlap. Elephant bulls favor temporal niche shift; they avoid direct encounters with cattle (or people) during the day but come closer to the boundary and to water at night. Overall, cattle herding creates a buffer zone between wildlife areas and human settlements. As the dry season advances, cattle range further into the protected area in search of forage. Buffalo water dependence takes precedence over avoidance of cattle leading to higher range overlap. Elephant bulls select areas even closer to the boundary at night and increase the number of excursions into the Communal area. Long term planning of artificial water provisioning is essential to maintain spatial segregation and mitigate conflicts such as disease transmission or crop-raiding.

Keywords: coexistence, conflict, habitat selection, movement ecology, temporal shift, resource partitioning, wildlife/livestock interface

*Speaker
Effects of fragmentation on the seed predation and dispersal by rodents differs among plant species

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Fragmentation influences the population dynamics and community composition of vertebrate animals. Fragmentation effects on rodent species in forests may in turn affect seed predation and dispersal of many plant species. Most of the current studies usually focus on this question by monitoring a single species, and their results were often inconsistent. Very few studies have discussed the fragmentation effect on rodent-seed interaction at the community level. These effects may be substantial given that fruiting periods for many coexisting plant species overlap. In order to get a whole picture of the fragmentation effect on plant-rodent interaction at the community level, we monitored the seed dispersal and predation of four fagaceae species in 12 different sized tropical fragmented forests with the areas from 6.3 ha to 13872.9 ha in southeast of China. The results showed forest fragmentation affected the seed fate of all the species, but the intensity and even the direction of fragmentation effect differed among species. The different effect of fragmentation on seed dispersal and predation among plant species may in turn translate into the composition differences of the regeneration of the whole fragmented forest. Our result also emphasizes that, in order to investigate the potential effects of forest fragmentation, it is necessary to look at the scale of the whole community.

Keywords: forest fragmentation, seed dispersal, rodent, Quercus acutissima, Castanopsis mekongensis, Castanopsis hystrix, Castanopsis echidnocarpa

*Speaker
Body size is poorly predicted by climate and net primary production in temperate songbirds

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Body size decline has been proposed as a universal response to climate warming, but empirical evidence is controversial. We test whether body size is negatively related to temperature, or rather explained by variations in food availability in French songbirds. We also explore whether annual, population-level variations of mean body size are due to changes of juvenile size and/or size-dependent mortality over the first year.

We tested for relationships between wing length (n = 107,193) or body mass (n = 82,022) and local anomalies in temperature, precipitation and primary production during the breeding period for 41 species, from 257 sites, for juveniles and adults separately. For four species and 46 sites, we assessed whether changes in mean population body size over the first year of life suggested climate-driven size-dependent mortality.

Juveniles were larger in years with locally high primary production. This only explained 1% of interannual size variation. Adults did not respond to any variable. We found no evidence of climate-driven size-dependent mortality.

Our results support that body size is mainly driven by food availability during the period of growth in temperate songbirds. We suggest that former studies evidencing a hot-induced size reduction were biased towards organisms from hot climates, operating close from their upper thermal limit. In the temperate climate of France, recent temperature increases would not have been sufficiently extreme to select against large individuals. Temperate songbirds would indeed be more constrained by cold than by over-heating. Hence body size decline is not a universal response to climate warming.

Keywords: body size, bird, Bergmann’s rule, heat diffipation, food availability, NDVI, temperature, precipitation, size, dependent mortality

*Speaker
Impact of a vegetable extract on the development of Rhynchosporium secalis causal agent of barley scald

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In Morocco, barley has a dual purpose: on the one hand it is used for human consumption and on the other hand for animal feed. Unfortunately, this culture is subject to several stress including biotic ones. Scald (Rhynchosporium secalis) causes high yield losses of barley (Hordeum vulgare). To develop an effective control against this pathogen other than chemical and cultural techniques and to prevent the poisoning of the animal species consuming it as green forage, it has resorted to biological control. In this research in vitro antifungal activity of Daphne gnidium on the diameter of two strains of Rhynchosporium secalis originating from Khemisset and Gharb RS1 and RS2, respectively is tested. Seven concentrations were tested 20, 40, 60, 80, 100, 120 and 140g/l. Results of the tests showed that the aqueous extract of D.gnidium induced a significant reduction of the development of the two strains. Indeed, the percentage of inhibition of growth of diameter reached 71.58% for RS1 isolate and 68.44% for the same concentration 140g/l.

Keywords: Rhynchosporium secalis, scald, barley, Hordeum vulgare, Morocco, Daphne gnidium, Antifungal activity.

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Comparative study of the production of two species of cephalopods (Octopus vulgaris and Sepia officinalis) landed by trawlers Sfax (Gulf of Gabes, Tunisia)

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Both Cephalopods, the common octopus Octopus vulgaris and cuttlefish Sepia officinalis are among the most species landed by trawlers in the Sfax region. These species have a great commercial value. In this work we study the average monthly production of each species and the annual production of these species for the past ten years. On the data base from surveys in the offshore port of Sfax, we could also determine and monitor for each species the average production output by trawler and the seasons. Annual production shows that trawl contributions have increased in recent years compared to previous studies. The average monthly output shows that the trawlers are variable inputs for the common octopus, cuttlefish while for the production evolves in the same way with a significant amount in the winter and a remarkable decrease in summer. Monthly monitoring of the average production per boat per trip for each species reveals that the production trawl common octopus and the cuttlefish is important in winter as in summer, intake is low especially for octopus.

Keywords: Cephalopods, Octopus vulgaris, Sepia officinalis, trawlers, production

*Speaker

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Climate change and the impact on pastoralism in sub-Saharan Africa: Case of the CEMAC cross-border hallway.

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The Pastoralism can be defined as the mode of rearing based on the mobility of pastoralists in search of pastures. It is subdivided into two types, namely, small transhumance and big transhumance. Pastoralism takes part in the economy of the arid and semi-arid zones of Africa, where nearly 50 million of pastoralists and about 200 millions of agro pastoralists live. Livestock techniques are constantly adapting to extremely variable environmental conditions, ranging from the spatial distribution of resources (forage, water) to health, social and economic contexts. Pastoralism, which supplies meat, including for export, plays an important role in the agricultural economy of the Sahelian countries and even in Cameroon. As a mode of development, it contributes to social stabilization and peace in marginal dry lands. Despite its advantages, sub-Saharan pastoralism becomes difficult to practice. The recent aggravation of climate crises has paid a heavy price. So what are the strategies for the promotion of pastoralism following the climatic changes in the CEMAC cross-border corridor and what are the consequences on the environment? It is in this perspective of management of natural resources and the sustainability of pastoralism that, this study on climate change is highlighted. Cameroon is sharing the lake Chad basin with others countries and its resources are touched by the climate change. So how do the pastoralists are managing? Key words: Pastoralism, climate changes, environment.

Keywords: Pastoralism, climate changes, environment.

*Speaker
Agriculture is facing major challenges today, such as the need to feed a growing number of people while decreasing input use in the context of an increase in environmental stochasticity. Agroecology is a way of answering these issues, promoting a more sustainable production, for example through organic agriculture. The development of agroecological practices is limited by a lack of varieties adapted to organic and low-input agriculture (conditions characterized by low or no use of chemical inputs to stabilize environmental variations and high field heterogeneity). Increasing plant diversity in fields, for example by cultivating heterogeneous populations or mixing varieties, is an interesting lever since it permits the stabilization of production, the optimization of resource use and pest and disease control. Since 2006 the DEAP team (INRA GQE le Moulon) and farmers from the Réseau Semences Paysannes are working in close collaboration on a participatory plant breeding project, aiming at developing heterogeneous populations adapted to each farmers’ practices and environment. After developing interesting populations, farmers from our network often mix these populations and are wondering how to select on-farm for adapted mixtures. Several practices were identified, such as selecting spikes inside the populations before mixing, selecting inside the mixture, selecting both before and after mixing, adding populations through years. My PhD project aims at understanding the impacts of different selection practices by farmers on mixtures’ performances.

**Keywords:** participatory breeding, on farm breeding, mixture, cultivated diversity
Population dynamics and its impact on carbon stock in regenerating oak forests: A study in central Himalaya

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Present study is focused on population dynamics of regenerating oak (Quercus leucotrichophora) and its carbon stock value in Lamgara (Almora) in Uttarakhand state. Oak is being suppressed by invasive pine (Pinus roxburghii) since the past five decades. However, our studies showed thriving future of Oak in the region. Oak dominates at all sites with higher IVI value varying from 126.96– 165.50 followed by IVI of pine 72.82– 128.14. Population structure shows higher presence of oak seedlings and saplings and young trees that favours the regeneration. Total basal area of sites varied from 17.0 m2ha-1 to 46.1 m2ha-1 where, oak contributed 5.5 m2ha-1-18.2 m2ha-1 and contribution of pine was found between 6.4 m2ha-1 and 26.1 m2ha-1. Lower tree density and high basal area indicate the presence of old pine trees while high tree density and lower basal area shows young population of oak. Oak also possesses higher carbon stock value than pine and this will enhance the carbon sequestration capacity in near future. Allometric equations were used to calculate biomass and carbon stock of the sites. Biomass of sites was found between 137.03- 503.27 Mg ha-1 and carbon stock varied from 64.40- 236.54 Mg ha-1; thus these regenerating forests contribute significantly in carbon sequestration. This regeneration of oak could be influenced by many different factors such as nutrient availability (especially nitrogen), moderate disturbances and past forest fires. Soil characteristics, leaf litter dynamics, fine root dynamics is being studied along with remote sensing to find out the reasons behind the phenomena.

Keywords: Oak, Pine, Population dynamics, Regeneration, Biomass, Carbon stock

*Speaker
Humanities and Natural Sciences
Microremains on lithic artifacts from Lapa de Taquaracu: implications for subsistence among paleoindian groups

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Paleoindian subsistence has always been a topic of discussion among archeologists studying hunter-gatherer groups in the Pleistocene–Holocene transition occupation of the Americas. However, the role of plants in the models of subsistence have been mostly inferred indirectly since plant macrorremains rarely survive in the archaeological record. With the goal to help with this problem, we present the results of starch grain analysis performed on lithics found in Lapa Grande de Taquaracu (occupied between 11,477 ± 133 cal. BP and 1,087 ±78 cal BP), an archaeological site bordering the Lagoa Santa area in Central Brazil. Various starch grains and other materials were recovered from lithic flakes and one unifacial artifact. The specific starch remains found, together with other microbotanical elements, indicate that these artifacts have been used in the processing of starchy plant parts. As far as we know, this is the most ancient evidence for the processing of starchy plants in the Americas.

Keywords: Paleoindian, Subsistence, Starch, Lagoa Santa, Archaeology, Archaeobotany

*Speaker
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Characterization of archaeological fibers by proteomic and stable isotope analyses.

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Fabrication of textiles is one of the first technologies. Strongly linked to the development of agriculture (cotton, flax...) and farming (wool), their study can provide new information on economic, environmental and socio-cultural practices. This study focuses on animal fibers from textiles and hair found in archaeological contexts. A double analytical approach is proposed based on the study of the hair principal protein: keratin. This protein can be characterized by proteomic technique using soft ionization mass spectrometry. Results are compared to the international databases to identify the species the protein belongs to. In parallel, isotopic analysis on carbon and nitrogen can be carried out bringing information on the diet, farming conditions and, to some extent, the geographical provenance of the animal. The results presented here come from two archaeological contexts providing well preserved fibers: the Northern coast of Peru and North-western China. The Peruvian sample includes the four different species of American camelids and come from different Pre-Hispanic sites. Their analysis aims to better understand the role of alpaca and llama wool in ancient Peruvian societies, and their use. The second area of interest is the Keriya Valley (Xinjiang, China), at the crossroad of different regions that became part of the Silk Road. There, various tombs dating from the Bronze and Iron Ages were found, providing hide and textile samples. The challenging distinction between goat and sheep fibers can be achieved by proteomics. Besides, the complementary analysis of wool stable isotopic composition may enable to observe species-related differences in herding practices.

Keywords: textile, animal fibers, proteomic, stable isotopes

*Speaker
Trophic levels study based on stable isotope analysis of tooth enamel (C & O) on a mammal collection from the Cambodian site of Boh Dambang

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A study of the trophic levels was performed on a collection of mammals from the Cambodian site of Boh Dambang in Southeast Asia. This karstic site presents an exceptional rich faunal assemblage, containing animal remains mainly accumulated during the late Pleistocene in spotted hyena dens, which are relatively few in Southeast Asia. Valuable information on the ecology and environment can thus be drawn by stable isotope analysis of tooth enamel on the different taxa present in the assemblage. In an environment of low latitude like that of the Boh Dambang site is, the distinction between C3 and C4 plants allows a reconstruction of diet of the different taxa. 55% in the first case and 35% in the second. The diet of the spotted hyena is composed of herbivores eating C4 plants that includes the largest cattle gaur and water buffalo. Some taxa may also hold some clues hinting to a change of environment, based on a change in diet, as it is the case with the sambar deer.

Keywords: South East Asia, stable isotopes, hyena, Cambodia, trophic study

*Speaker
Dynamics of vegetation cover and exploitation of wood resources in Central Anatolia during the early Neolithic period: anthracological study of Asikli H’oy’uk (Cappadocia, Turkey)

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The study of the charcoal remains from different archaeological contexts and levels at the Neolithic site of Aşıklı H’oy’uk (Cappadocia, Turkey) had two main objectives. The first was to reconstruct the vegetation cover around the site and analyze its evolution through time in relation to the increase of demography and major social changes taking place between the IXth and the VIIIth millennium cal. BC. The second was to explore different aspects of the exploitation and the use of wood resources. The taxonomic identification of more than 2600 charcoal fragments from 37 different archaeological contexts in levels 4, 3 and 2, allowed us to show the presence of a woodland composed of pistachios, almonds and deciduous oaks around the site, which is not currently present in Cappadocia. Pistachio wood was the main fuel used by the community. Furthermore, a small exploitation of a gallery forest was also observed. A preliminary dendro-anthracological study, based on a hundred of oak fragments, showed some particular characteristics linked to the preferential use of small diameters of wood (twings, branches and young trunks). This study must be pursued in order to define if these small diameters were caused by regular cutting (woodland management). Finally, the occasional use of decade wood was shown by the presence of insect and fungi attacks in some pieces of charcoal.

Keywords: Anthracology, Neolithic, Central Anatolia

*Speaker
Fire use in the Amazon: a case study of ethnoarchaeological work with the Asurini of the Xingu River

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Fire is an element endowed with corporality, agency and personality as constitutive characteristics, and surrounds human and non-human persons with its flames, lights, smells and heat. This work intends in discussing the roles that fire portrays amongst the Asurini, an indigenous group of Eastern Amazon, Brazil. Two aspects of Asurini fire use will be discussed. One such aspect is related to how fire use in the clearing of cultivating fields and landscape transformation is intermediated by the supernatural being Aí and how communication with this entity is established by performatic actions of fire ignition by Asurini individuals in the field. The other aspect of symbolic Asurini fire discussed relates to the central fireplace located in the Tavyva, the Asurini’s communal house and cemetery, and how this fire structure bounds Asurini individuals together through ceremonies related to the establishing and maintaining of this impressive architectural element.

Data related to both of these aspects of Asurini fire use, as an intermediate between the supernatural entities and as an agent in the forming of the Asurini society – for it is only after the building of the Tavyva that a village is finally formed – will be discussed regarding how theories from native knowledge involve regimes that deal with a Cosmo politics which manages the social as well as the supernatural.

Keywords: Amazonia, Fire use, Asurini of Xingu

*Speaker
Discussing the symbolic importance of cultivated plants to indigenous Amazonian populations: the case of the Asurini of the Xingu River

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The Asurini, an indigenous group located in Eastern Amazon, possess a recent history marked by struggle and resistance. When contacted in 1971 by the Brazilian Government Agency responsible for indigenous people in National territory the Asurini had suffered a great reduction in their demography, the result of decades of continuous conflicts with indigenous populations and with various sectors of the white colonization front. The first efforts in ethnological fieldwork with the Asurini in the 1980’s already pointed to the fact that their cultivated plants may be an important element in understanding the recent history of the group. To the Asurini, cultivated plants act as concrete links to their recent past, and in their impressive testimonies on the continuous process of movement and conflicts, these reports mention not only the loss of villages, objects and even people, but also frequently of cultivated plants, in a way in which these end up being resignified and reapropriated regarding their ability to punctuate and document this traumatic process. In the testimonies of the Asurini Exodus, various plants are cited, sewing stories of difficulties and doubt, serving as guiding threads for recapitulating moments through the dialogue between plants and places, even if these were only temporary living areas until the next forced movement. Based on information obtained in the field, this work intends in demonstrating how the Asurini’s relations with their cultivated plants is a form of synthesis of how they understand their recent history and how they relate to their traditional territories.

Keywords: Amazonia, Cultivated Plants, Identity Construction, Traditional Territories

*Speaker
Discussing the dietary patterns of indigenous groups in the Cerritos through the stable isotope analysis

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In the last two editions of the YNHM we presented some important results on the chronology of the Cerritos, which are archaeological sites described as earthen mounds, present along the lowlands of the Pampas biome and La Plata Basin, among Brazil, Uruguay and Argentina. The earthen mounds located at the Patos Lagoon, southern Brazil, were built for different functions over time including temporary camps and residential household, refuse disposal areas, ritual places and, perhaps agriculture. From the archaeological record, hearths found on the base of the mounds suggest the beginning of occupation around 2200 cal BP, when the Pontal da Barra swamp was occupied as transient fish camps. After that, there is a clear process of architectural complexity between 1800 and 1200 cal BP. The later period of occupation, according to the radiocarbon dates was approximately 800 cal BP. This process converted the Pontal da Barra to an important and meaningful place, abandoned only after centuries of systematic occupation. The reason of the abandonment of Pontal da Barra is not clear. In this work we intend to present the first results based on collagen stable isotopes analyses of the archaeological samples (human and faunal remains) from Cerritos. With the results of the δ13C and the δ15N we shall discuss the main dietary patterns and the most possible main animal protein food sources of these groups. We intend to contribute to the understanding of their behavior and economy, clarifying some questions about some Cerritos dynamics.

Keywords: Stable isotopes, Cerritos, Brazil, Collagen, Dietary patterns

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How do people see biodiversity? The use of a digital identification key for a citizen science program.

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"Spipoll" is a French citizen science program about pollination. To assist the volunteers, a multi-access identification key is available on the Spipoll website. The pictures, identifications and series of steps followed by the participants have been recorded since September 2015. These data allow to study the behaviour of the citizens when they observe an insect, and to deduce the taxonomic confusion and the misunderstanding of character states. The identification paths give elements on how the entomofauna diversity is perceived. Which morphological traits are chosen most frequently? Are the most noticeable characters selected to the detriment of those which need advanced entomological skills?
Here we show that some morphological parts are perceived more easily than others, and that people are sensitive to the quality of character descriptions in the keys. These elements must be taken in account in order to improve identification tools, in particular those used by the general public.

Keywords: Spipoll, identification key, citizen science

*Speaker
Entomological study of sand flies, vectors of leishmaniasis in Morocco: case of Marrakesh-Safi region

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Leishmaniasis is an endemic parasitosis in tropical and subtropical areas and Mediterranean basins. More than 98 countries are involved with a total of 350 million People at risk and 12 million cases of infection. In Morocco, leishmaniasis has been a serious public health problem since 70s. Three clinical entities are known in Morocco: Zoonotic Cutaneous Leishmaniasis with *Leishmania major*, anthroponotic cutaneous leishmaniasis with *L. tropica* and both forms Cutaneous and visceral to *L. infantum*.

The Marrakech-Safi region contains three active foci of cutaneous leishmaniasis with *L. tropica* in the provinces of Chichaoua, Al Haouz and Essaouira, in addition to sporadic cases of Visceral leishmaniasis. Our entomological investigations in this region have as objective to update the entomological data and to compare composition and abundance Between the endemic (Chichaoua, Al Haouz and Essaouira) and non-endemic areas (Marrakesh, Safi and El Kalaa of the Seraghna) of the region.

The results showed the co-existence, in our study area, of all vector species of the three leishmanias responsible for Moroccan foci of leishmanioses, namely *Phlebotomus papatasi* proved vector of *L. major*, *P. ariasi*, *P. longicuspis* and *P. perniciosus* Vectors of *L. infantum* and *P. sergenti*, a proven vector of *L. tropica*. The distribution As well as the specific abundance of sand flies has shown a great Difference between the endemic and non-endemic areas of the region.

**Keywords:** Leishmaniasis, sand flies, Entomological investigation, Marrakesh, Safi

*Speaker
On the tracks of Neandertals: the first study of the footprints from Rozel (Normandy, France)

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† 1

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Hominin footprints, and more particularly those associated with Neandertals, are very scarce in the fossil record. However, they give a unique point of view on dynamic moments of individuals’ life that the fossil remains don’t allow to obtain. Moreover, their study enables to get a lot of paleobiological information, for example about the anatomy or the composition of a group but also on the biomechanics of gait.

The Middle Paleolithic site of Rozel (Normandy), which was occupied by Neandertals between 85 000 and 65 000 years BP, have yielded over a hundred footprints since 2012 besides its consequent archeological material (stone tools, charcoal, animal remains,…).

We report here the results of the first paleobiological study dealing about these footprints. The analyses led according to a wide corpus of comparison and an unpublished methodological development, have shown that the footprints from Rozel are unique in the knowledge of hominin footprints. Indeed, these footprints represent the vast majority of the known footprints associated with Neandertals. Thanks to measures on footprints of anatomically modern humans and on those from Rozel, a minimum number of 9 individuals was determined. Furthermore, using footprint length to stature ratios, these individuals are estimated to have been between 0.69 and 1.86 m in height, suggesting a group of different ages from childhood to adulthood.

The knowledge gained constitutes a solid basis from which advanced studies have begun about the biomechanical walking patterns of Neandertals and their mobility.

Keywords: Neandertals, footprints, Rozel, height, gait

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Zooarchaeological analysis of faunal remains from the ritual site of Pachacamac: first insights into the sacrifice of camelids

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Pachacamac is a major site of the Peruvian central coast, occupied from the fifth to the sixteenth century AD. This presentation will report the results of an on-going analysis of faunal remains recovered during the 2016 excavation campaign within the framework of the Ychsma Project. Amongst the considerable amount of material, an almost complete camelid skeleton in a very good state of conservation was discovered. The room 4 of the B15 building where it was located is a building that had a ritual function. Other offerings were found nearby: numerous bones of camelids but also of other species like guinea pigs or shells. The detailed zooarchaeological analysis that we carried out on the above mentioned camelid has enabled us to identify the species sacrificed, to estimate its age, to determine the colour of its hair, how it was sacrificed and its orientation and position within the context. The current study has provided preliminary insights into the practice of sacrifice and offerings of camelids (the most important domesticated species in Peru at that time) on the site of Pachacamac but also on the potential breeding practices. Such offerings of camelids on the central coast of Peru are not yet well documented and have only been so far the subject of a limited number of studies. The gained insights will be further corroborated by the continuation of the zooarchaeological analysis of the faunal remains accumulated since the beginning of the Ychsma project in the late nineties.

Keywords: zooarchaeology, Peru, camelids, sacrifice

*Speaker
The Easter ’Bunny’: exploring the bio-cultural history of the rabbit (Oryctolagus cuniculus) and the brown hare (Lepus europaeus)

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Easter is the most important event in the Christian calendar yet we know little about its origins, spread and adoption across Europe. Similarly, the animals associated with Easter – notably the rabbit (Oryctolagus cuniculus), brown hare (Lepus europaeus), and chicken (Gallus gallus) – have equally obscure histories. All of these are anthropogenic introductions to northern Europe but the timing and circumstances of their arrival are currently little understood. This paper will discuss my PhD research which forms part of the forthcoming Arts & Humanities Research Council (AHRC)-funded project, Exploring the Easter E.g. – Shifting Baselines and Changing Perceptions of Cultural and Biological ‘Aliens’. I will discuss how osteological analysis of archaeological lagomorph (rabbit and hare) remains can be integrated with material culture, history, folklore and linguistics to provide new perspectives on the introduction of the brown hare and rabbit to Britain and their role in the development of modern Easter traditions.

Keywords: Easter, brown hare, rabbit, bio, cultural history, non, native fauna, zooarchaeology, linguistics, folklore

*Speaker
Rio do Meio: shallow site, high potential

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The pre-colonial ceramic costal site of Rio do Meio (Florianópolis, Brazil) is a so-called shallow site which presents a high number of faunal remains. Rich in quantity but also in diversity of many species, this site represent a great possibility to better know these understudied groups that occupied the coast of Brazil about 1000 years ago. During this transition time between shellmound builders and more recent fishers-hunters-gatherers, humans groups - have created a differentiated lifestyle, which seems to increase diet with marine mammals and oceanic top-chain fauna. Bioarchaeological and archaeozoological data point in this direction, although the later, so far, are still preliminary. How, why and by/with who are the questions by which the archaeozoology studies are now trying to understand the existing relations between human and the surrounding nature. In Rio do Meio site, the repartitions maps and the stratigraphy with some initial analyses of the faunal collection open an understanding of the function of the site and the dynamic of its formation, particularly in the question of the presence of sharks rests.

Keywords: Archaeology, Archaeozoology, Zooarchaeology, Shallow site, Shellmound, Sambaqui, Shark, Brazil

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Anonymous Burial and Technical Remains in Indian Trans-Himalaya

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Every culture has its own worldview with beliefs. Extensive work has been done in India regarding burial and material cultural framework but excepting the part of Indian Tran-Himalaya. Only two annals are available which brings some evidence on human burial remains from Kinnaur (Sankrityayan 1948, Singh 1999) Himachal Pradesh. Since then no work has been done to explore these burial and material cultural remains in Indian Trans-Himalayan region. Trans-Himalaya off course has been found rich in burial culture; since this region has been poorly investigated to understand the emergence of metallurgical advancements in respect to Indian sub-continent. Therefore to fill up this gap I joined excavations and did some field work in this area. I focused on the burial sites of Kinnaur to understand the nature of burial practices in this remote part of Himachal Pradesh that whether these burial practices were a part of a larger system of disposal of dead in northwest Indian Himalaya in Ladakh, Malari in Central Himalaya and other parts of Trans-Himalaya like Mustang in Nepal, the western Tibet, where such practices were in trend since protohistoric times. I would also discuss the possible long distance trade network in the Trans–Himalayan region and Western Tibet since early historic period and the development of pyro technology for metallurgical and non-metallurgical activities by the burial practicing communities in this part of Trans–Himalaya. The present work makes an attempt to study and understand the emergence of burial and material culture in this larger Tran-Himalayan region.

Keywords: Trans, Himalaya, Burial, Pyro-technology, Metallurgy
Historical and contemporary enlightenment from Confucian environmental ethics in the perspective of moral judgments and dimensions

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In the worldwide industrialization and globalization process, humankind is facing with severe challenges of global ecological crisis. In western perspectives, Aldo Leopold’s and Roderick F. Nash’s thought have been extensively studied and discussed in the environmental ethics studies. However the wisdom of Confucianism, especially the moral judgments and dimensions of Confucian environmental ethics has not been systematic investigated. This paper firstly introduced Confucian environmental ethics with review and comparison with Western perspectives. By comparison, The philosophy of “Unity of nature and Humankind” () provides the important historical care and clue for dealing with the relationship between human and nature. Also, based on ”kindness to things principle” () ,”save things and compassionate the people” () and ”using the natural resources according to their time” ()this paper tries to sort out the moral of Confucian environmental ethics with reference to the personal environmental ethic behavior which effectively reduce the tension between human and nature. Confucian environmental ethics is grounded on human nature which is the essence of all things and it has the benevolence () which embraces unique and enriching ideas that the paradigm of dualism could not accommodate. As a result, a harmony relationship between humankind and nature through the general laws and basic experiences was observed in Confucianism Philosophy. The Confucian environmental ethics is a kind of harmonious ethics and has promising implications for the formulation of a new theory of environmental ethics showing eastern wisdom.

Keywords: Confucianism Philosophy, Confucian environmental ethics, Unity of nature and Humankind, moral judgments and dimensions, benevolence

*Speaker

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Archaeozoological analysis of mammalian assemblage from the lower Pleistocene site Cooper’s D (Bloubank Valley, South Africa): Implications for study hominin subsistence behaviors

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Cooper’s Cave is located in the Cradle of Humankind (UNESCO), 1.5 km northeast of Sterkfontein, 1 km southwest of Kromdraai, approximately 45 km northwest of Johannesburg (South Africa). The Coopers D deposit, dated between 1.5 and 1.4 million years old by U-Pb, has yielded seven hominid specimens (six Paranthropus robustus and one unidentified hominid). A previous taphonomic study on a primate fossil assemblage suggests that Parahyaena brunnea is the main bone accumulating agent. Our study was focused on the identification of the taphonomic agent(s) responsible for mammal accumulation from Cooper’s D and the palaeoecological context of Paranthropus robustus.

Zooarchaeological methods were conducted on 588 large mammal remains from Cooper’s D East deposit. Taxonomic diversity and paleoecological reconstructions were undertaken using a database including 7 828 specimens from both East and West deposits.

We applied classical quantitative methods used for bone specimens (NISP, MNE, MNI). Palaeoecological analyses were conducted using Fleming’s histograms and the Simpson’s Index to measure the taxonomic diversity. All of the 588 specimens were observed using binocular and DinoLite microscope.

This preliminary study permitted to confirm that brown hyena (Parahyaena brunnea) is the main accumulating agent of large mammal bones. Palaeoecological analyses, made with methods unused so far in the context of South African sites, reconstructed a relative open savanna with some wooded zones and contributed to explore the context of hominin subsistence behaviors during Early Pleistocene.

**Keywords:** Prehistory, Paleoenvironment, Archeozoology, Paleoanthropology, Human Evolution, South Africa, Paranthropus robustus

*Speaker
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Predicting archeological boar’s lifestyle from their remains: Calcaneum morphology as plastic marker of captivity

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The Neolithic revolution, which corresponds to the beginning of animal and plant domestication and to the shift towards a sedentary lifestyle that is the root of our societies, is considered as a major shift of the human history. Understanding the early stages of the process is necessary to conduct research on the domestication history, which involve being able to distinguish archaeological remains of wild animals from remains of individuals in the earlier stages of domestication.

This study aims to compare the calcaneum morphology from five French wild boar (Sus scrofa) populations, two captive wild boar populations, and four domestic pigs. The goal is to determine if it is possible to distinguish wild boars, captive boar and domestic pigs, and then to apply these potential results on samples from 7 archaeological French sites from the Mesolithic and Neolithic periods. Analyses were made from coordinates of 958 landmarks placed on 64 calcaneus 3D models: 27 Wild, 20 captive, 4 domestic and 13 archaeological.

The results have shown that the plastic deformations caused by the captivity are similar to hereditary deformations from the domestication syndrome, and that these deformations consist mainly in a twist of the epiphysis. Finally, predictions confirmed wild lifestyle for specimens from Noyen 2, and for some of the specimens from Noyen 3 and Roucadour. They have instead determined that other specimens from Noyen 3 and Roucadour were probably rather captive or domestic, which can lead to change the assumptions about the arrival of domestic pig on these sites.

Keywords: pig, domestication, calcaneum, geometric morphometrics, archeozoology, neolithic transition, suidae

*Speaker
The effectiveness of place-based strategies on climate change communication

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With the Paris Agreement, countries have pledged to promote strategies and policies to substantially reduce their carbon emissions. To align public sentiment with potentially expensive climate mitigation policy, climate change education is considered an essential tool in tackling climate change, particularly for the young generation. However, a general lack of engagement is driven by the perception that climate change is irrelevant at local and individual scales with psychological distance. This study was conducted in 12 rural areas of China to compare the observed trends of extreme climatic events from local seniors to the meteorological data first. Also, based on a modified version of the Theory of Planned Behaviour, we implemented a new climate change educational programme that adolescents communicated with local seniors (aged ≥ 60 years) in focus groups to discuss local climate over the past decades. The results showed climate change can be observed and perceived by individuals in their own lifetimes. Importantly, based on mediation analysis, the shift in adolescent perceptions of climate change, such as concern and perceived behavioural control, translated into greater willingness to support climate change mitigation. Thus, we suggest that place-based strategies that highlight the relevance of global climate change through local impacts and individual experiences vis-a-vis intergenerational communication has considerable potential to promote greater engagement with global issue.

Keywords: Climate change, place, based strategies, intergenerational communication, behavioural intention

*Speaker
Assessing Population View and Socio-Economic Impacts of Flood Episodes in Abidjan, Côte d’Ivoire

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Urban flooding is recognized as one of the most serious challenges large cities are facing around the world. It causes destruction of properties and major health risks related issues for residents. It occurs when intense convective rainfall events create runoffs that are greater than the capacity of the urban drainage system. However, anthropogenic practices can act as additional factors that increase the flooding occurrence. This study seeks to assess the population perceptions of risk of floods and its socioeconomic impacts in the residential district of Cocody in Abidjan (Côte d’Ivoire). An integrated approach was applied. This included direct field observation, meteorological data analysis, geographical survey and household (n=584) oral interviews regarding population perceptions and socioeconomic impacts of flood episodes. Two rainy seasons (April - July and October- November) are found critical to flood occurrence in Abidjan. The precarity of the drainage system and its mismanagement are seen as the first causes of flooding in Cocody. This led to impacts such as injuries, materiel damages and displacement of affected populations. Although the population are aware of flooding causes and potential impacts, they (73%) lack adequate responses. In spite of efforts made by District’s authorities, more than 70% of the residents need to be assisted. For an efficient flood management system, collaboration between authorities and impacted populations should be considered.

Keywords: Abidjan, geographical survey, perception, socio, economic impacts, urban flooding.

*Speaker
Anthropogenic landscapes: the case of the archaeological site Teotonio.

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Waterfalls are not abundant landmarks in the Amazon basin. Perhaps that is why we can consider them significant places: that is, a place created by people through their interaction with nature and the supernatural which is recognized, individually and collectively, through experiences and memories, thus defining its significance.

The Teotônio waterfall, on the upper Madeira River in southwest Amazonia (near the border between Brazil and Bolivia), is certainly a significant place. Archaeological research has shown that human occupation in this locality dates from at least 6500 BC to the present.

This longevity of occupation is an exceptional case in Amazonian archaeology. Waterfalls are symbolic landmarks in Amerindian Cosmologies, as well as being rich environments to live along-side. In the relational context between society and the environment, which is the theme of this symposium, it should be highlighted that Teotônio waterfall was famous for its abundance and diversity of fish species.

From the perspective of Historical Ecology, humans did not just adapt to, but actively altered, the environment. In the archaeological site of Teotônio we identified the very early use of domesticated plants, and it is also one of the few archaeological sites to have Amazonian Dark Earth strata up to four meters deep, demonstrating a high degree of anthropogenic landscape modification.

Keywords: Amazonian archaeology, Historical Ecology, Amazonian Dark Earth, Anthropogenic landscape, Archaeological site of Teotônio

*Speaker
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Changing crop biodiversity and resource use efficiency of traditional and introduced crops in the Indian Cold Desert: a case study from Lahaul Valley, Himachal Pradesh, India.

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Emphasis on market economy and motive of ‘maximisation of profits’ have changed the agrobiodiversity and agroecosystem management in Indian Cold Desert. These changes though benefitting people monetarily, have increased their vulnerability to market risks. In Keylong (Lahaul Valley, Himachal Pradesh) traditional cereal and medicinal cash crops (Saussurea lappa and Inula racemosa) are being replaced by introduced cash crops (pea, potato, cauliflower etc.). Crop biodiversity, its changing patterns alongwith Energy Use Efficiency and Monetary Analysis were the focus areas of this study. The entire cropped area is dedicated to cash crop cultivation, 93% of which is under introduced cash crops and only 7% under traditional varieties. It is interesting to note that traditional cereal cultivars have been completely wiped off from the system. Organic manure obtained from night soil and animal wastes accounted for 60% and 90% of total inputs in introduced and traditional crops respectively. Energy output/input for traditional crops was averaged at 1.6; for introduced crops it varied from 0.5 (cauliflower) to 1.8 (peas). Monetary outputs were comparable for both traditional and introduced varieties. Importantly traditional cultivars not only were more energy viable but also dependent on resources available locally. For purpose of food security and environmental conservation there is a need to establish balance between traditional and introduced crops. This will make farming sustainable in the cold desert environment where crop growth period is limited. Lahaul valley is landlocked due to heavy snow deposits at Rohtang pass (3978m) and remains accessible only for 5 months (July–November).

Keywords: Indian Cold Desert, traditional vs introduced crops, Energy and Monetary Efficiency, Lahaul Valley.

*Speaker
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Palynological studies have been marginally attempted and minimally applied in archaeological contexts in the Philippines. From its first application in Balanghai I archaeological site in Butuan, the field has been intermittently considered in providing information about the human-environment relationship. Pollen analyses on sediments have been investigated on different lithological types and different sites in the archipelago. While few available literature exhibit a positive record of pollen succession, many unprinted reports described several sites unsuitable for pollen preservation. These unsuccessful palynological works are not published, thus, various factors causing sterility are not understood. All palynological applications, both successful and unsuccessful are reviewed. Negative results occurred significantly from sediments assumed a priori to be "good deposits" and "pollen-poor".

Keywords: palynology, negative results, lithological type
Tracing the introduction of domestic animals in Austral Africa using paleoproteomics

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Reconstructing population migrations is a central question in archaeology. In Africa, the exact timing and route of migration of pastoral populations during the late Holocene remains an open question. Documenting the route of the first introductions of domestic caprines from Eastern to Southern Africa could give valuable information about these first pastoralists. Classical approaches of bone determination using comparative anatomy do not always succeed in distinguishing between close related species such as sheep (Ovis aries) and goat (Capra hircus) because of the high morphological similarities between the two species. Moreover, these archaeological remains are sometimes highly fragmented making distinction between domestic caprines and wild gazelles tricky. Here, we report the use of palaeoproteomics on caprine remains from the site of Leopard Cave (Namibia). This site was chosen because it gave the oldest caprines remains of Austral Africa. We intend to complete our dataset with other sites in Austral Africa in order to compare the results obtained for those sites and draw a map of caprine diffusion. Prior to any other analysis we estimated the amount of organics preserved in the remains using infrared spectroscopy (FT-IR). Based on the results, we concentrate on the extraction of structural proteins to characterize their sequences using mass spectrometry. The obtained results allow us to characterize unreported protein that could not only discriminate between the species, but also give information about their environment.

Keywords: Africa, domestication, caprines, paleoproteomics

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The Archaeology of Death and Dying in Central Luzon, Philippines: Mortuary Practices of the 10th to 16th Century CE People of Porac, Pampanga

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Mortuary rites and customs are observances associated with death and burial. They are associated with religious beliefs and conceptions about the nature of death and the existence of an afterlife. They also have significant psychological, sociological, and symbolic functions for the family and community of the deceased. Thus, the examinations of the ways in which the dead are treated in different cultures leads to a better understanding of the diverse beliefs and worldviews about death and dying. Porac is a mountainous town in Pampanga, Central Luzon Island, Philippines. For the past 70 years, the locality has been explored and excavated by archaeologists. The first one was carried out by Goodall in 1935 and the last one was in 2002 by the Archaeological Studies Program of the University of the Philippines. This study focuses on the analysis of the burials found in the different sites in Porac. Specifically, it will identify the different types of interment utilized by the people in burying their dead. Also, it will describe the different grave goods and other funerary furniture interred together with the body of the dead. Moreover, it will articulate the ritual performances and customs associated with burying the dead such as location of the burials and post-burial observances and rites. Furthermore, it will explicate the significance of these burials and grave goods on dating the different archaeological sites in Porac, the social stratification in these prehistoric communities, and the economic system that is associated with the circulation of these non-local funerary materials.

Keywords: Burial, Death, Archaeology, Philippines, Pampanga

*Speaker
The first settlement of America, studies of external factors related to the phenotypic variability of Amerindian populations

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The first men to have colonized America went through Beringia and seems to have come from East Asia, but it is still to this day uncertain whether it was done through one or multiples migrations. For decades, researchers have been trying to address this problem through different methods. The first morphological analyzes were carried on the cranial variation, because it presents properties of heredity and plasticity. Here we will consider the mandibular variability and attempt to demonstrate if, when compared with the skull, it is possible to observe distribution patterns that reflect the history of peoples and their adaptations related to the environment. Our study is the first to integrate populations from the entire American territory and populations from East Asia and to use 3D geometric morphometric methods for analysis. This study on mandibles corroborates some observations on the cranial variability, including Amerindian ”relics” populations. Although our results demonstrate that the skull is more susceptible to external influences, the mandibular morphological variation expresses a division by geographical areas between extreme environments and its study thus offers understanding for the history of populations in the context of the first peopling of America.

Keywords: Native american, first settlement, migration, geometric morphometric, 3D, mandibule shape, cold adaptation

*Speaker
Baka’s traditional knowledge as a first step towards documenting wild edible mushrooms in the Republic of Congo

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Baka and Aka are generic names referring to hunter-gather community members living in the rainforest of Central Africa region and whom livelihood mainly depends on forest resources. Their population has been estimated to about 500,000 in Central Africa countries (Seshadri 2005). Although the arrival of some companies in the environment contributes to some extent to the well-being of some Baka members, the majority of them still highly depend on natural resources to meet their different needs. These resources are threatened across the world due environmental and cultural changes (Shengji 2003). Facing such threats of Baka’s rich culture on Wild Edible Mushrooms (WEM), we worked in close relationship with Baka and Aka namely Mbenzele and Ngombe as a principal source of information on WEM in our study area to get a first insight into the diversity of edible macrofungi by these groups. The main aim of the study is to document and preserve their Traditional Ecological knowledge on WEM in the Republic of Congo (RC), a country where edible macrofungi still understudied (Boa 2006). We used a structured interview coupled with specimen collecting in the forest. Fifty men and women were interviewed and 124 local names obtained for edible mushrooms in both languages of which 33 shared, 63 exclusively Mbenzele and 28 exclusively Ngombe. Thirty-seven species were obtained while 62 local names still not have correspondence in scientific name yet. Compared to the work by Malaisse et al. (2008), we only found eight species in common but with different vernacular names.

Keywords: Edible mushrooms, Bomassa, Makao, Mbenzele, Ngombe, Thanry

∗Speaker
An archaeobotanical study from a Norse Greenland wooden artefact assemblage

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Used in construction and boat building, for domestic productions or as a fuel source, wood has been a key material for human societies throughout time. For people living in Medieval Scandinavia, trees and timber were essential elements of their culture. That is something noticeable in every settlements of the North Atlantic islands. Despite numerous analyses have been conducted on the topic of wood use in Scandinavia, the British isles and the North Atlantic islands, this subject is still poorly known, especially in the eastern Arctic and Greenland. This is unfortunate since numerous collections are available and this kind of study raises important questions related to timber procurement and use in a dynamic historical and environmental context. For this presentation I would like to set forth the results of an analysis involving 252 wooden artefacts from three sites (Sandnes, Umiiviarssuk and Austmannadal) located in the Norse Greenland settlements, along with a global problematic focused on wood procurement strategies and transformation in this area. Many studies on woodland diversity and location have been conducted over the years, but very few combine taxonomic analysis with a more traditional artefact function study. The wooden artefact assemblage comprises a wide range of object types made from several wood species and so raises two main questions. What is, respectively, the part of local, drifted and imported wood in order to better understand the origin and circulation of wood resources? What are the differences compared to other artefact assemblages from Norse settlements in the North Atlantic islands?

**Keywords:** Archaeobotany, Driftwood, Norse Greenland, Wood identification

*Speaker
Three-dimensional models of pre-Columbian skulls with cranial deformation, and the morphological implications to craniovascular system

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According to the descriptions supplied by Columbus and the chroniclers of the Indies, the Aboriginal groups of Central & South America, and Caribe, applied different techniques to transform the morphology of the skull. The pre-Columbian’s deformed skulls from Cuba, present an oblique-tabular fronto-occipital artificial cranial warp, which is a cultural characteristic element of the Arawak–Taino indigenous communities. This type of cranial deformation was induced immediately after birth. Although, not all Taino’s skulls were deformed, this feature is typically used as a cultural identification of this population. This practice disappeared in the early years of Spanish colonization. Here we present three-dimensional reconstructions of five specimens from the Anthropological Museum Montané in University of Havana. This is the first time a 3D model of these fossils has been made, which have remained unstudied for the last decades. In order to compute the 3D reconstruction we used close range Structure-from-Motion photogrammetry technique. Our main goals were to identify the main deformations over the skull surface, and to investigate the implications of cranial deformations in the structure of the vessels through the analysis of craniovascular epigenetic traits.

Keywords: pre–Colombian, Arawak–Taino, cranial deformation, photogrammetry, craniovascular

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Zooarchaeological and archaeogenetic implications on the history of sheep husbandry in Estonia and possibilities for further research

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Sheep (Ovis aries) in Estonia have been studied zooarchaeologically and (archaeo)genetically. Analyses of the mitochondrial DNA D-loop of ancient (from the Bronze Age to Modern Period) as well as of modern native sheep have shown: (1) presence of at least two maternal lineages; (2) high genetic diversity through time; (3) possible population expansion during the Middle Ages; (4) continuity of some of the haplotypes from the Late Bronze Age to present-day; (5) differences in genetic diversity between ancient and modern populations. Overall, these results coincide with the pattern of utilisation seen in the zooarchaeological material and the descriptions of sheep husbandry in the written records. It seems that despite the observed fluctuations in the ancient sheep populations and changes in ecology, power regime, and other influential historical events, the matrilineal basis of the populations has remained largely the same, and has continued to modern native sheep.

The following research, however, needs an application of more detailed questions, material and methods to tackle the problems about the arrival of the first livestock to the North-Eastern part of Europe and the position of local sheep in a wider phylogeographical context in Eurasia. For these issues, phenotypic, whole nuclear and comprehensive Y-chromosome analyses are required. In zooarchaeological part of the upcoming study, morphometric analysis and more elaborated data on sheep consumption must be addressed.

In my presentation at the YNHM 2017 meeting, I will introduce the results of my recent doctoral research and discuss the plans for the following post-doctoral project.

**Keywords:** sheep, Ovis aries, zooarchaeology, archaeology, ancient DNA, native breeds, Estonia, North Eastern Europe

*Speaker*
Faunal remains of Kanlitas H‘oy‘uk: Aspects on human-animal-environment interaction in Anatolia during 6th millennium BC

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Kanlitas H‘oy‘uk is an Early Chalcolithic mound site situated at the edge of a mountainous region of north-western Anatolia. It is considered as one of the most important settlements of Chalcolithic Porsuk culture and a connecting site for the cultural contact between Central Anatolia, Western Anatolia and Balkans during 6th millennium BC. People of this settlement were manufacturing marble bracelets as well as cultivating crops intensely. However, faunal remains suggest that Kanlitas people were still regular hunter for their basic subsistence. Archaeozoological study demonstrates a verity of animal species from the settlement e.g. wild micro fauna (Lepus sp., Testudo graeca etc.), birds (Alectoris sp., Anas sp., Goose sp. etc.), fish and other aquatic species, carnivore species (Felis sylvestris, Canis lupus, Vulpes vulpes, Ursus sp. etc.), wild ungulate species (Equus spp., Sus scrofa, Cervus elaphus, Dama dama etc.) as well as domesticated ungulate species (Bos sp. Ovis aries, Capra aegagrus hircus). The identified species from Kanlitas H‘oy‘uk present a diverse ecology and habitat system which indicate a mixture of subsistence strategies as well as different aspects of Kanlitas peoples’ interactions with their environment. This presentation is aimed to give a glimpse of the biological diversity, animal exploitation as well as human-environment interaction in North-West Anatolia during Early Chalcolithic period through the light of the faunal remains from Kanlitas H‘oy‘uk excavation.

Keywords: Kanlitas H‘oy‘uk, human, environment interaction, Chalcolithic, Anatolia

*Speaker
Woolly mammoth and Man at Krasnoyarskaya Kurya site, West Siberian Plain, Russia (excavation results of 2014).

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Detailed paleobiological and taphonomic analyses were carried out on the bone accumulations discovered during the 2014 excavations at the Krasnoyarskaya Kurya site, southeastern part of Western Siberia (Russia). The fossiliferous site contains three bone-bearing horizons. The middle and lower levels yielded exclusively remains of the woolly mammoth, *Mammuthus primigenius*. The middle level is a result of an *in situ* accumulation in alluvial sediments. At least three individuals are identified: a juvenile (< 6 – 10 years old in AEY) of 1.8 m shoulder height and weighing 1 ton; a young adult (ca. 24 years old in AEY) and an old mammoth (> 43 years old in AEY) of 2.9 m of shoulder height and 3.8 t. Their remains were buried in conditions similar to those of a floodplain scroll/natural levee or an islet. The lower level is composed of at least four animals: two juveniles (< 6 – 10 years old in AEY) and two adults (> 11 - 13 years old in AEY). Excavations between the years 2007-2010 had allowed the discovery of Palaeolithic artefacts in the lower level, which was formed in alluvial-lacustrine conditions. It is likely that at the beginning of spring, the oxbow lake had trapped woolly mammoths. Humans and carnivores had then sorted out and taken away any useful remains. Radiocarbon dating indicates that the mammoths died at the early phase of the Last Glacial Maximum, about 14C–20000 BP (~24000 years cal BP) and were living in a steppe landscape dominated by grass-like vegetation.

**Keywords:** Paleobiology, Late Pleistocene, Russia, West Siberian Plain, Woolly Mammoth, Taphonomy

*Speaker*
Reconstructing Late Holocene plant assemblages of the Naachtun Mayan city area (Petén, Guatemala): development of a new bio-proxy.

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The Petén rainforest, in the Guatemalan lowlands, is home to Mayan archaeological sites among the most known and studied (El Mirador, Tikal, Yaxha). Despite numerous studies undertaken on the Mayan societies, man-environment interactions still remain misunderstood. As part of the archaeological project ”Naachtun-Peten Norte”, we focus on reconstruction of landscape dynamics of Naachtun territory. This Mayan classical site (150.CE – 950.CE) is bordered to the north by one large topographical depression, named Bajo, characterized by seasonal water stocks. In these environments, pollen is rarely preserved conversely to phytoliths which appear as a good alternative to reconstruct the local plant assemblages. However their taxonomic identification in the Mayan zone is poorly known.

In order to develop interpretations after fossil phytolith assemblages, we set up a preliminary study of the current vegetation in the Naachtun territory. This study is based on two criteria: the distribution of current plant communities and the link between phytoliths assemblages and associated vegetation. The aim is to understand the ecological signal of the phytolith assemblages preserved in the sedimentary record. This study brings new data on the interpretation of phytolith assemblages in predominantly woody zones. Six great modern woody environment types have been described in Naachtun territory. Among those, five could be characterized with phytolith analysis. The Arecaceae and Poaceae phytoliths allowed notably distinguishing forest types whereas the phytoliths of woody dicotyledons (Globular and Sclereid types) provide limited ecological information. This work on central-american phytoliths contributes to develop a new palaeoenvironmental tool for studies

*Speaker
on palaeo-vegetation dynamic.

**Keywords:** Phytoliths, Environmental Calibration, Maya zone, Rainforest, Wetland
The origins of botany and landscaping in São Paulo, Brazil: Oswaldo Cruz Garden and the legacy of F.C. Hoehne

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Previously to the establishment of the São Paulo Botanical Garden; before the creation of the city-gardens by the Cia. City; and even before the neighborhood merged with the urban area of São Paulo capital city, the Oswaldo Cruz Garden was opened at Instituto Butantan. Although the Garden was originally created with the purposed of cultivating toxic and medicinal plants, it played a bigger role during its almost 100 years of history. In this work we aimed to shine a new light on history of the Oswaldo Cruz Garden analyzing it through the botanical and landscaping perspectives considering the historical background for its creation. Our results show that despite the usual association of Instituto Butantan with snakes and other reptiles, this was the birthplace of Botany as a science in São Paulo. Through the work of Frederico Carlos Hoehne, head of the Garden during its foundation, the area became relevant for the construction of the public space in the city during the beginning of the 20th century. The plant species originally cultivated in the area are still relevant for the urban arborization of the city and to other matters as well. Additionally, we highlight the role of the Garden as a place where scientific research and the communication with the public walk together.

Keywords: public space, urban arborization, science popularization, Botany, Landscaping, History

*Speaker
What if fishermen disappeared before the fish?

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On Réunion Island is practiced the traditional fishing of "bichiques". This Malagasy term (= fry, small) refers to post-larvae of amphidromous gobies which recruit massively into rivers, where they are caught. Decline in post-larval abundance is a concern to their high economic and patrimonial value in addition to their ecological importance. Since 2014, fishing activity historically informal, is in the process of being regulated. This decision which does not receive the unanimous support of fishermen, reactivates the debate between actors. The aim of this contribution is to confront perceptions and expectations of fishermen to those of the other stakeholders concerned, including the state. This qualitative analyse takes into account 30 semistructured interviews and is based on one year of field study at Réunion Island. The results of the survey reveal the drifts of a pressurized socio-ecosystem in which everyone has their share of responsibility, from the consumer to the politician. The integration of fishermen into management indicates a positive change in the state strategy but some measures imposed are still far from reality in the field and lead to the persistence of disagreements.

Keywords: Bichiques, Réunion Island, Management, Stakeholders

*Speaker
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From smell to action, a study of smell-sensitivity and uses of nature

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In the 21st century, western societies appear more and more separated from nature, notably in urban contexts (Soga & Gaston, 2016). However, regular contacts with urban nature have been shown to have positive effects on human health, cognitive and psychological restoration (Bratman et al. 2012). The experience of nature is complex and multisensory. Sensory experience of nature has been studied mostly through vision and audition. In contrast, despite its importance in the construction of human self and identity, the sense of smell remains poorly included in the understanding of individual psychological relations to nature. In a quantitative study, we studied the individual relations between neurological and physiological smell sensitivity, affective and emotional connection to nature and actual sensory experiences in natural spaces. An online questionnaire combined a Chemical Sensitivity Scale (Nordin et al., 2003), the environmental identity scale (Clayton, 2003), and five questions assessing declared sensory uses of natural spaces in respondent’s everyday life. Based on the answers from 500 French adult respondents, we showed that people who have a high smell sensitivity also have more sensory uses of natural spaces, and that this correlation is mediated by their environmental identity. This first result calls for a better understanding of the smell and sensory experiences of nature, on how these experiences can influence the way we interact with natural spaces, and of perspectives for nature spaces uses and management.

Keywords: human, nature relationship, experience of nature, sensory experience of nature, olfactory experience, smell sensitivity.
Scorpion envenomation is an important health problem in many part of the world. In the Maghreb area, scorpions of Androctonus genus are responsible of about 100 000 stings per year. In this study, we modeled current scorpion envenomation risk using ecological niche models (ENMs) of species belonging to Androctonus genus through the combination of high resolution presence data and environmental factors. Altitude, slope and five bioclimatic attributes were found to play a significant role in determining Androctonus scorpion species distribution. Ecological niche models showed high concordance with known distribution of the species. Produced risk map identified broad risk areas for Androctonus scorpion envenomation, extending along Marrakech-Tensift-Alhaouz, Souss-Massa-Draa, and some areas of Doukala-Abda and Oriental regions. Considering these findings ENMs could be useful to afford important information on distributions of medically important scorpion species as well as producing scorpion envenomation risk maps.

**Keywords:** Androctonus genus, Ecological niche models, Morocco, Risk maps, Scorpion envenomation.
An ethnobotanical study of wild medicinal and food plants used by local people of Tataouine in the south of Tunisia

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An ethnobotanical study was carried out in the years 2012–2014, during both dry and rainy seasons in Tataouin (south of Tunisia). We focused on plants used as medicines and/or food, in order to highlight the role of wild plants in the livelihood of local communities, and possibly to find out plants with potential pharmacological interest. Ethnobotanical data were recorded through semi-structured interviews, filed in a database and quantitatively analyzed. Informal interviews involving 32 informants provided data about 123 useful wild plant species that are distributed across 37 families and 104 genera.

A total of 297 citations were recorded, concerning 132 ethnospecies (folk taxonomic units not necessarily corresponding to single botanical species). For medicinal purposes, 59 ethnospecies (185 citations) were reported and 25 ethnospecies (68 citations) for food purposes. The main used parts resulted to be leaves followed by whole plant and seeds.

Results show that people living in Tataouine hold a valuable knowledge of the uses of plant resources and that some of the plants cited by the informants represent an important component of the local livelihood strategies.

Keywords: Tataouine, Tunisia ethnobotany, wild plants, pharmacological

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Strategies used by the saffron producers of Taliouine (Morocco) to adapt to climate change

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In Morocco, the mountainous regions extend over about 26% of the national territory where 30% of the total population live. They contain opportunities for agriculture, forestry, pastureland and mining. The production systems in these zones are characterised by crop diversification. However, these areas have become vulnerable to the effects of climate change. To understand these effects in relation to the population living in these areas, a study was carried out in the zone of Taliouine, in the Anti-Atlas. The vulnerability of crop productions to climate change was analysed and the different ways of adaptation adopted by farmers were identified. The work was done on saffron, the most profitable crop in the target area even though it requires much water.

Our results show that the majority of the farmers surveyed had noticed variations in the climate of the region: irregularity of precipitation leading to a decrease in quantity and an uneven distribution throughout the year; rise in temperature; reduction in the cold period and less snow. These variations had impacts on the cropping system of saffron and its productivity. To cope with these effects, the farmers adopted various strategies: better management and use of water; diversification of agricultural activities; increase in the contribution of non-agricultural activities to their gross income; and seasonal migration.

Keywords: climate change, adaptation strategies, Taliouine, saffron, perceptions

*Speaker
Systematics, Evolution and Comparative Anatomy
Trabecular bone properties in the Border Cave 3 infant ilium: Implications for the onset of independent gait in early modern Homo sapiens

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The Border Cave 3 (BC3) infant skeleton has been understudied, despite its importance as a rare example of a fairly complete immature skeleton of early modern Homo sapiens. Based on its dental eruption pattern and a modern human standard, BC3 is 4-7 months old. The study aim is to compare pelvic structure of the BC3 infant to an ontogenetic series of recent modern human infants. Specifically, trabecular structure in the ilium is quantified to investigate whether the BC3 infant matches an equivalently-aged recent modern human. We test the hypothesis that early modern and recent modern H. sapiens infants began independent gait at equivalent ages. Trabecular properties were collected from high resolution images generated by microCT scans of the BC3 infant and eight recent modern humans spanning 0 – 36 months. Using Quant3D, bone volume fraction, trabecular number and thickness, and degree of anisotropy (DA) were quantified in nine volumes of interest per ilium. Although the BC3 infant is considered 4-7 months old, its generally high DA resembles that observed in older recent modern humans (6 – 36 months). Similar trabecular thickness and number in the BC3 infant and equivalently-aged recent modern human infants may reflect equivalent age-related bone modeling processes. However, organizational (DA) differences may reflect greater efficacy in bipedal gait in the former (i.e., an earlier onset). These results suggest that the BC3 infant may have been more advanced in independent gait than recent modern human infants of the same age, which may have implications for differences in parental care.

Keywords: ontogeny, infant, locomotion, bipedal, trabecular, pelvis, ilium

*Speaker
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Cranial morphology and disparity in the endemic Euplerids from Madagascar (Carnivora, Mammalia): do they display a greater disparity than other carnivoran families?

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The Eupleridae are a monophyletic family of Carnivora (Mammalia) comprising 8 extant Malagasy endemic species. Their presence on the island is explained by a unique event of colonization from an African ancestor closely related to the Herpestidae (mongooses). The Eupleridae then experienced a diversification phase leading to species occupying extremely diverse ecological niches. In order to study this amazing diversity the aim of this work was to quantify the disparity of the Eupleridae and compare it to that of other carnivore families. Morphological variation was quantified using 3D geometric morphometrics on the cranium of 13 families of terrestrial Carnivora. Our results showed that Eupleridae display a high phenotypic disparity, but not as high as that of Mustelidae and Procyonidae. Moreover, the ecological characteristics of these species, such as diet and locomotor behavior did not seem to fully explain this significant disparity.

Keywords: Carnivora, Mammalia, geometric morphometry, skull, evolution

*Speaker
Species-specific AFLP loci resolving taxonomic uncertainty in Capparis species

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*Capparis spinosa* is a plant native to the Mediterranean region and used in agriculture, food industry, medicine and cosmetic. Due to free hybridization of different species and occurrences of intermediate forms, the taxonomic status of the *Capparis* species is controversial and unsettled. The aim of study was to assess the phylogenetic relationships between six morphologically distinct Caper species in order to resolve their classification ambiguities on the base of three primer combinations of amplified fragment length polymorphism (AFLP) markers. Out of 750 fragments generated 636 were polymorphic and 407 of them were restricted to a single species. The three AFLP primer combinations showed the same power to discriminate between the *Capparis* species. STRUCTURE and PCoA analyses clearly separated each species into a distinct genetic population. The UPGMA analysis grouped all the species into 3 main genetic groups: C1 presented *C. spinosa* subsp. *spinosa* var. *spinosa* and *C. sicula* subsp. *sicula*, procumbent species with persistent stipules that are slender and curved but not thorny; C2 grouped *C. ovata* subsp. *ovata* and *C. orientalis*, pendulous species with deciduous stipules that are slender and straight but not thorny; and C3 clustered *C. zoharyi* and *C. aegyptia*, erected species with evergreen stipules that are spiny, wide and crooked. Accessions from C1, C2 and C3 were mainly distributed in arid, sub-humid and semi-arid bioclimates respectively. Genetic studies on a large *Capparis* collection using these species-specific AFLP loci will help to assess the diversity within species and, phylogeography and hybridization between species.

**Keywords:** Capparis, AFLP, genetic distance, phylogeny, population structure.

*Speaker
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Distribution and infraspecific morpho-ecological variability of Ambrosina bassii L. (Araceae) an endemic of western-central Mediterranean aroid

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The monospecific genus Ambrosina is represented by Ambrosina bassii L., an endemic species of western-central Mediterranean mainly studied in Sicily and Corsica. The objectives of this study were to establish the distribution of this species and to determine its habitat and ecology in Tunisia. Moreover, the infraspecific diversity from recent and old collections throughout its range is characterized. The analyses of 8 leaf traits not considered by previous authors have uncovered the 4 varieties reported in this species and complete their morphological description.

The soil and climate conditions favorable to their development (bio-climate, rainfall, elevation, pH, texture, assets and total limestone content of the soil) are determined. If three varieties are widely distributed in all of the species' range, A. bassii var. angustifolia appears to be rare with a very restricted distribution in Algeria.

**Keywords:** leaf morphology, ecology, Tunisia, varieties.

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Molecular phylogeny and taxonomic revision of the salamanders Bolitoglossa altamazonica and B. peruviana (Caudata: Plethodontidae) from Peru

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In this study, we used morphological and molecular phylogenetic data to assess the relationships among members of the Bolitoglossa altamazonica sensu stricto species group (restricted geographically to Peruvian Amazonia). We conducted phylogenetic analyses based on the mitochondrial Cytb gene and nuclear Rag1 gene. We recovered a reciprocally monophyletic group composed of four species: B. altamazonica, B. digitigrada, B. peruviana and Bolitoglossa sp. nov. Our results reveal two subclades, one including [B. altamazonica + B. peruviana] + Bolitoglossa sp. nov. and the other including Bolitoglossa sp. Ituxi + Bolitoglossa sp. Jurua from Brasil. Additionally, our phylogeny indicated that the Ecuadorian Bolitoglossa form a highly divergent clade from the Peruvian samples. As a result, we propose that the Ecuadorian species might be reassigned to B. equatoriana sensu stricto and B. equatoriana sensu lato species group (previously named B. peruviana sensu lato). Given that the holotype of B. altamazonica is not longer available, we designated a neotype for B. altamazonica; this neotype was collected near the type locality. We also provide new material of B. peruviana collected near the type locality of this species. We describe a new species of Bolitoglossa from premontane rainforests in northern Peru at 485-1311 m elevation. The new species is distinguished from its congeners by its morphological characteristics, ventral coloration and DNA sequences. This new taxon is the fourth species of Bolitoglossa endemic from Peru.

Keywords: Bolitoglossa altamazonica, molecular phylogeny, morphometrics, cryptic species

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Importance of the Quatrehomme Collection (Monnaye Museum, Meung-sur-Loire) in the French paleontological landscape

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François Quatrehomme (1910-1996) mainly searched for fossils in the Faluns of Touraine and of Blésois. This Middle Miocene formation is known for its abundant vertebrate remains. In 1996, he decided to bequeath his collection to the city of Meung-sur-Loire, where it has been hosted since 2005 (municipal museum La Monnaye). This collection is described by Ginsburg as "modest to very modest" and there is no accurate inventory. In order to highlight this collection and better understand its importance, an inventory of the terrestrial mammal remains is in progress.

Inscriptions on the specimens identify the localities (mostly quarries) and date the discoveries. In the current state of the inventory 30 different locations were identified, mostly in the Savigné-sur-Lathan Basin. 3,266 specimens, covering eight of the nine orders of terrestrial mammals found in the Faluns, are currently registered in the data set.

To date, the most impressive published Faluns mammal collection is the Hartmann one, hosted at the volunteer "Musée du savignéen" (Savigné-sur-Lathan). While this "huge" collection contains 1,475 mammal remains (marine and terrestrial), we estimate that the Quatrehomme collection encompasses more than 7,500 terrestrial specimens. Moreover, the Quatrehomme collection contains very rare and uncommon fossils. It is the largest known Faluns collection of Pliopithecus (25 specimens) and of Lagomorpha (1,354 specimens). Also, eight Tapiroidea specimens (including a jaw with teeth) and three Chalicotherium remains are inventoried.

This collection is now being studied in detail. In the next few years it will take a more prominent place in the French paleontological landscape.

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Keywords: Faluns, collection, mammals, Miocène, inventory, paleontological landscape
Deciphering the origin and evolution of extremely halophilic archaea: the Halobacteria and the Nanohaloarchaea

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The analysis of conserved core genes has allowed disentangling most of the ancient relationships in Archaea1. However, some nodes remain debated, like the phylogenetic position of extreme halophilic lineages, the Halobacteriales and the recently described nanosized Nanohaloarchaea2. The former were alternatively proposed as the sister-lineage of methanogens Class II3, Methanocellales4 or Methanomicrobiales5, while the latter was proposed as the sister-lineage of Halobacteriales2 or a member of the recently proposed DPANN super-phylum6. Both thrive in high-salt environments and require salt for growth. Pinpointing their phylogenetic positions is crucial because it will improve our knowledge of the deep evolutionary history of Archaea, and in particular if adaptation to high-salt concentrations occurred twice independently in this Domain of Life. It will also help us deciphering the molecular adaptive processes and the evolutionary paths that allowed the emergence of these extremophiles.

Here, using comparative genomics approaches, we identified more than 250 proteins carrying a reliable phylogenetic signal to address this issue. By combining approaches allowing limiting the impact of non-phylogenetic signal on phylogenetic inference7 we showed that Nanohaloarchaea branches with Methanocellales, while Halobacteria grouped with Methanomicrobiales, indicating that they represent two independent lineages. This implies that adaption to high salinity emerged twice in Archaea, and that phenotypic similarities observed in these lineages result from convergent evolution and/or horizontal gene transfers. Finally, this suggests also that the grouping of Nanohaloarchaea within DPANN lineages is the consequence of a tree reconstruction artefact, which could challenge the existence of this group.

Keywords: halophilic lineages, evolutionary history, archaea, comparative genomics

*Speaker
The skull shape elongation in the crocodylians’ natural history: An evolutionary trend explained by Seilacher’s triangle

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The adaptationist paradigm of the Synthetic Theory has been criticized. A more pluralistic view suggesting that historical (phylogenetic) and structural factors may explain parts of the observed phenotypic variation has been proposed (Seilacher’s triangle) but remains marginal. Here we perform a quantification of the phylogenetic, functional and structural components of crocodylians skull elongation. Snout elongation is a homoplastic feature in Crocodylomorpha and its adaptive significance is about hypothesis. Therefore, we defined three factors (historical constraint, structural constraint, adaption) hypothethically explaining the snout elongation. We assessed a “coefficient of skull lateral acceleration” in the stereotyped behavior in crocodylians during prey catching (the lateral bite) as a functional factor. We show that slender-snouted skulls are lighter and offer less drag than those with broad snouts during lateral bite. As a structural factor, we used Von Mises stresses, a good predictor of failure which assessed that slender-snouted skulls experience higher stresses during biting. Finally, we used Pagel’s lambda to quantify the phylogetic signal assuming both molecular and morphological calibrated trees. This phylogenetic test assesses if a feature evolves randomly or if the degree of relativeness between the species explains phylogenetic patterns. We conclude that crocodylian skull shape variation is the outcome of a mechanical trade-off between hydrodynamic efficiency and mass reduction for catching agile aquatic prey (functional factor) and strength for subduing and processing prey (structural factor).

**Keywords:** Historical constraints, Structural constraints, Adaptation, Crocodylians, Functional morphology.

*Speaker*
Comparative anatomy and phylogeny of the Forcipulatacean starfish (Asteroidea, Echinodermata)

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Among echinoderm groups, the use of both molecular and morphological data favoured the emergence of a comprehensive and operational systematics in Echinoidea and Ophiuroidea. Unfortunately we are far from reaching such a consensus in the Asteroidea, despite a background of 30 years of modern phylogenetic analyses. Debates on starfish phylogeny still oppose various hypotheses, each supported by both molecular data and morphological characters. Recent researches demonstrate that a large set of morphological characters can be defined from comparative anatomy of skeletal elements (ossicles) for phylogenetic purposes, describing ossicle shapes, articulations among ossicles, marks of soft tissues on the skeleton (e.g. tube feet or muscle insertions). Both extant and extinct taxa can be analysed conjointly in phylogenetic studies of ossicle characters, which may help with tree rooting and consideration of fossils. The superorder Forcipulatacea is one of the major monophyletic groups with about 400 extant species, morphologically well-delimited, and for which a few phylogenetic hypotheses are available for its internal relationships. We explored the diversity of morphological features expressed in the group, considering 21 extant species and 5 fossil forms. The anatomy was investigated from progressive dissection of specimens from the zoological collections of the Muséum National d’Histoire Naturelle, Paris. The comparative work allowed definition of about 70 characters, a majority being new (\~{}33\%) or reconsidering previous homology hypothesis (\~{}42\%). Four distinct taxon of each major clade of living forms (Velatida, Valvatida, Paxillosida and Spinulosida) were tested as outgroup for rooting.

Keywords: Asteroidea, Forcipulatida, Systematics, Phylogenetics, fossils

*Speaker
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Phylogenetics of Sus strozzi and Sus minor: confirming a long debated hypothesis and comments on Sus taxonomy

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Sus is the most-species rich genus in the family Suidae, and is currently divided into the ‘scrofa’ group, with Sus scrofa as its only member, and the ‘verrucosus’ group, which includes species from South-east Asia. This division is mainly due to morphological differences, but recent molecular studies confirm the monophyly of both groups. Sus minor and Sus strozzi are two extinct European species. Taxonomists noted closer affinities between these two species and the verrucosus group, but a phylogenetic relationship has never been tested using cladistic methods. In this study we obtained data from the literature and collected new characters from museum specimens, integrated our morphological matrix with DNA sequences, and demonstrate for the first time that S. strozzi and S. minor are nested within the verrucosus clade. Furthermore, we show that the main character (i.e. the morphology of lower canine) used by some authors to distinguish the scrofa and verrucosus groups does not carry phylogenetic signal.

Keywords: Suidae, cladistics, homoplasy, Dasycoerus, phylogenetics, taxonomy

*Speaker
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A head fit for big brains: the joint evolution of the human skull and brain

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Scientists have long favoured cranial features as clues to reconstruct the story of human evolution. This is because of the relative abundance of skulls in the fossil record, as well as the high number of diagnostic features observable on them. One major characteristic of human evolution is the development of large brains and of complex cognition. For this reason, the evolution of brains in fossil hominins and in Homo sapiens draws considerable scientific attention. The study of endocasts - their volume, general morphology, convolutional patterns, and the development of cognitive areas recognised in extant humans - may have little to tell us in terms of function, but it does allow for the identification of derived characters with potential phylogenetic and evolutionary value. Because of the high morphological integration between the outer vault of the skull and the endocranium, it is difficult to list reliable independent diagnostic features for these two aspects of the head. The pressures on skull morphology may relate to environmental changes, diet, modifications in the sensory organs, brain development, or the use of articulate language, whereas the brain undergoes reorganisations which may be due to the development of cognitive areas. There is however very little literature concerning the joint evolution of the skull and endocast. We will present some morphometrical data derived from a sample of fossil and extant hominins, aiming at starting to clarify the relationship between the morphologies of the skull’s outer vault and the endocranium throughout the evolution of the genus Homo.

Keywords: palaeoanthropology, human evolution, endocast, palaeoneurology, Homo, morphology, comparative anatomy

*Speaker
New perissodactyls (Mammalia, Laurasiatheria) from early Eocene of the Paris Basin and their biogeographic implications

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The Perissodactyla – the group that includes extant horses, tapirs and rhinos - appeared during the Paleocene-Eocene transition and quickly spread in the Northern hemisphere. Their origin area is still debated but the hypothesis of an Asian origin is favoured. The recent discovery of new species of perissodactyls sheds a light on the biogeographic relations within this early group. The locality of Le Quesnoy has yielded one of the oldest and most complete fauna from earliest Eocene (MP7 biohorizon, France). We discovered two new perissodactyls that led to major implications for the biogeography of this group. The smallest species, Pliolophus sp. nov., is well represented by dental and postcranial elements. It presents resemblances with English species from MP8-9 biohorizon, but is different from MP7 species of Palette or Rians (Southern France). A size difference is observed between small Southern species and larger Northern species. This is consistent with the observed differences in faunal composition between the Paris basin and Southern Europe. As no physical barrier was present between North and South in France, a climatic barrier has been suggested in previous studies to explain this diversity. The second taxon described is the first European 'isectolophid', and gives us clues for a very early migration from Asia to Europe in perissodactyls history.

Keywords: Perissodactyla, early Eocene, biogeography, Pliolophus, Paris basin

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Monogenea of the genus Lamellodiscus parasites of four species of Sparidae from Moroccan Atlantic coast

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The study of gill ectoparasites of four species of Sparidae, Diplodus sargus L., 1758, Dentex gibbosus Rafinesque 1810, Lithognathus mormyrus L., 1758 and Sarpa salpa L., 1758 of Moroccan Atlantic coasts, has identified several species of Monogenea Monopisthocotylea with a distinctive kind criteria of Lamellodiscus genus including 4 new species to science. Different host species present a simultaneous gill parasites by at least two species. Thereby, from D. sargus, we collected L. neifari, L. mirandus, L. gracilis, L. elegans, L. ignoratus, L. ergensi, L. furcosus and L. confusus, from D. gibbosus we found L. ergensi with two new species, on Sarpa salpa we observed L. confusus and two other new species, while L. verberis and L. furcosus were collected from Lithognathus mormyrus. We also note the presence of some Lamellodiscus species on more than one host species namely L. confusus (D. sargus and S. salpa), L. ergensi (D. sargus and D. gibbosus) and L. furcosus (D. sargus and Lithognathus mormyrus).

If species of Lamellodiscus are characterized by a specificity of stenoxène type and can not be used to mark their host species, the new species could, in turn, mark the different populations of their hosts.

Key words: Sparidae, Dentex gibbosus, Diplodus sargus, Sarpa salpa, Lithognathus mormyrus, Monogenea, Lamellodiscus, Atlantic, Morocco

Keywords: Sparidae, Dentex gibbosus, Diplodus sargus, Sarpa salpa, Lithognathus mormyrus, Monogenea, Lamellodiscus, Atlantic, Morocco

*Speaker
New insights toward the classification of angraecoid orchids in Central Africa and Madagascar (Vandeae, Orchidaceae)

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The infra-familial phylogenetic relationships within the orchid family are only partly misunderstood, in large part because of the complexity of certain groups such as the angraecoids. Our NSF funded project, started in 2011, led to the successfully re-assessment of generic limits within the Continental African member of this group. However, it focused mainly on African species and did not emphasize Malagasy taxa. In order to produce a comprehensive classification of the angraecoids and to quality good specimens, our orchid shadehouse network was

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extended to Madagascar. Shadehouses in Ambatovy, Antananarivo and Vohibe have facilitated inventories of eastern escarpment rainforests and the High Plateau. To date, more than 280 sampling plots have been censused to obtain high quality material. The shadehouses currently house nearly 7,000 living orchids accessions (13,783 total plants) and have yielded 3,618 flower samples preserved in alcohol and leaf samples in silicagel, plus 6,242 photographs, greatly facilitating the identification of species. To test the monophyly of certain Malagasy genera and clarify several problematic taxonomic novelties, as part of our assessment of relationships with Continental Africa genera, we conducted phylogenetic analyses of molecular sequence data from one nuclear (ITS) and five plastid DNA markers (matK, rps16, trnC-petN, trnL-trnF and ycf1) using a comprehensive sampling of > 510 taxa belonging to 83 genera. Our work has also led to improve knowledge on 245 Malagasy orchid species (about 25% of the species on the island) and 22 taxonomic novelties have been brought to light.

**Keywords:** Madagascar, Angraecoids, Phylogeny, Taxonomic novelties, Shadehouse
Cenozoic Batoid record from Contamana, Peru, with special focus on freshwater potamotrygonins (Chondrichthyes, Myliobatiformes) from the Pebas wetland system.

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Among the ichthyofaunal remains collected in the Tertiary deposits of Peruvian Amazonia, elasmobranchs show an unexpected richness of rays, gathering mostly potamotrygonins (river stingrays), but also pristids (sawfishes) and rhinopterids (cownose rays). Among the Potamotrygoninae subfamily and beyond the recovering of the middle Eocene Potamotrygon ucayalensis in the oldest levels, three new fossil species of Potamotrygon (P. contamanensis nov. sp., P. canaanorum nov. sp., and P. rajachloeae nov. sp.) are described from late Oligocene-late Miocene deposits along the Quebrada Cachiyacu, near Contamana, Peru. These new fossils fill a substantial gap in the sporadic fossil record of this exclusive freshwater elasmobranch subfamily, native to South America, thereby highlighting their ancient biological and ecological diversity. In the absence of sharks, the occurrence of obligate freshwater potamotrygonins and of other marine to brackish batoids along nine successive fossiliferous levels supports the predominance of fluvial-lacustrine environments in that region throughout the considered period, with a peak of marine influence around the middle-late Miocene transition, as recorded in other areas of Western Amazonia.

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Keywords: Batoids, Cenozoic, Peruvian Amazonia, Potamotrygoninae, Paleoecology, Paleoenvironment
How does the worm bite? The stomatogastric nervous system in Gnathostomulida

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Gnathostomulida is a small phylum of marine microscopic animals, characterized by the presence of cuticular jaws in their pharynx. Along with Micrognatozoa and Rotifera they constitute the clade Gnathifera, which is considered a sister group to all remaining Spiralia (annelids, mollusks, flatworms and their relatives) and hence might be important for understanding the evolution of this diverse group. The stomatogastric nervous system (SNS), innervating the pharynx and digestive tract, is present in several animal lineages and likewise reported from all gnathiferan phyla, where it comprise a pharynx-related ganglion and nerves. However, its presence in gnathostomulids has been contested by some authors. Our research on the nervous system of Gnathostomulida, based on immunohistochemistry and confocal laser scanning microscopy, confirmed the presence of a SNS in all major evolutionary lineages of Gnathostomulida. Moreover, we proved direct connection between the buccal ganglion and the brain, indicating at least a partial control of the former by the latter. The SNS consists of a simple buccal ganglion (with only about 40 cells), buccal nerves extending anteriorly along the pharynx, and sets of glandular and ciliated receptive cells with presumably receptive function, similar to the receptors known from rotifers and micrognathozoans. Our results show that the overall architecture of the SNS in Gnathifera is relatively conservative, most probably due to the crucial function of the SNS in jaw movement control, food uptake and processing. Eventually we will present preliminary hypotheses on the functionality of the SNS in Gnathostomulida and propose how to test them.

Keywords: Stomatogastric nervous system, Gnathifera, Spiralia, CLSM, immunohistochemistry, neuroanatomy
Recent research on Gastrotricha (Metazoa), towards a better understanding of their evolution?

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Gastrotricha, or hairy-backs, is one of the main groups of Spiralia (Metazoa), the animal clade comprising, among others, annelids, mollusks and flatworms. These small aquatic, microscopic worms are often found in the interstices of sandy sediment, moving around by ciliary gliding. There are still relatively few studies conducted on this peculiar group, despite their putative key position in the Spiralia phylogeny. However, recent discoveries have added important knowledge to the understanding of the gastrotrichs, from their position in the Metazoan phylogeny to their taxonomy and inner anatomy: phylogenomic studies now place them as the sister group to flatworms, a result so far difficult to interpret morphologically. Furthermore, four new genera have been described over the last few years, giving a better understanding of the diversity of the group, which so far comprises only 800 described species. Last but not least, recent confocal microscopy studies have provided large amount of data on the anatomy of this group, revealing new characters of potential phylogenetic and functional importance. For instance, a brain nerve ring has now been recovered in many gastrotrichs, as well as anterior and posterior ganglia in some subgroups of gastrotrichs. These different results on gastrotrichs offer a sharper picture of the diversity and the evolution of this group. Together with other recent studies on the morphology and phylogeny of various Spiralia, they contribute to a better understanding of the evolution of this diverse group of metazoans.

**Keywords:** Phylogeny, Anatomy, Taxonomy, Protostome, Marine Biology, Gastrotricha

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Exploring the interplay between ontogenetic trajectories and morphological evolution in early amphibians: a geometric morphometric approach

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Temnospondyls were the largest amphibian clade during the Paleozoic and Mesozoic, with more than 300 species known to date. They lived in a wide range of habitats and presented different life cycles, including species with aquatic larvae that transformed gradually into aquatic adults, others with aquatic larvae that suffered a drastic metamorphosis that led to fully terrestrial adults, and neotenic species. Despite of this, the cranial morphology within the clade is largely conserved, especially the dermal skull roof. Herein, I address whether the ontogenetic allometric patterns of the skull roof in temnospondyls are also conserved or reflect the variety in ecological adaptations and life-cycles. Using geometric morphometric techniques, I computed the ontogenetic allometries of 13 temnospondyl species by multivariate regressions of shape on size and compared them by visual comparisons of deformation grids and by exploring the allometric space constructed from the slope coefficients of the regressions. A conserved pattern of morphological change during ontogeny is recovered across the clade and the distribution of the ontogenetic trajectories in the allometric space reflects neither ecological adaptations nor life strategies, but follows the phylogenetic relationships within temnospondyls. This conservatism in ontogenetic trajectories suggests strong constraints in cranial development and this, in turn, may explain the low morphological disparity in adult morphology.

Keywords: Temnospondyli, allometry, ontogeny, geometric morphometrics
A Phylogenetic Perspective on Biogeographical Divergence of the Flora in Yunnan, Southwestern China

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In recent years, increasing studies suggest that biogeography incorporating with phylogenetic analyses has benefited the revealing of the origin and evolutionary history of flora. In this study, we reconstruct the mega-phylogeny of the floras of three representative regions across Yunnan, southwestern China, and analyze the floristic phylogenetic structure and beta diversity, aiming to investigate the phylogenetic patterns of regional floras and discuss the influence of geological events on the shape of contemporary floras. We found conspicuous divergence in the pattern of phylogenetic structures, which is most likely related to historical biogeography. The flora of southern Yunnan has been shaped by the strike-slip extrusion of Indochina and the region’s stable climate, while the flora of northwestern Yunnan has evolved with the uplift of Himalaya-Tibetan Plateau and the oscillations of the glacial-interglacial periods. The flora of central Yunnan has nearly equal proportions of the northern and southern floras that may be derived from a common Tertiary tropical or subtropical flora. In short, these geological events fit well with the floristic phylogenetic patterns across Yunnan. This study highlights the importance of comprehensive analyses to improve our understanding of the origin, evolution and divergence of regional floras.

Keywords: Phylogenetics, Biogeography, Flora, China, Geological events, Evolutionary histories.

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Evolutionary Changes in the Synarcual of Batoidea over Geological Time

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Batoidea (skates and rays) are the sister clade to Selachii (sharks) and are the most morphologically varied body forms amongst extant Elasmobranchii (Chondrichthyes). The synarcual (fused anterior vertebrae) is a synapomorphic feature amongst extant batoid species but does not appear in all extinct batoid groups; previous research into the batoid vertebral column has been limited to general morphology with no comparative study on the evolutionary changes of the synarcual over geological time.

This work details the structural changes of the synarcual since its first appearance in the fossil record (Lower Jurassic, ~182.0 Mya), to modern batoids. Most of the observations were from macrophotography of fossil specimens from the Natural History Museum, London (NHMUK). The majority of the fossil specimens studied were from the Rhinobatidae (guitarfish) family (Rhinobatos whitfieldi, R.maronita, R.intermedius, R.grandis) and Asterodermus platypterus. Extant species (R.formosensis) were also studied and detail of the synarcual was collected through computed tomography (CT) scanned images which were 3-D rendered.

The results show that there is a progressive change in morphology, which included an increase in synarcual length, a decrease in number of centra enclosed within the synarcual, and the comparatively tighter articulation with the basicranium. This study shows that the synarcual has become increasingly important to the function of the batoid axial skeleton and largely influences the mode of locomotion and feeding mechanism. Future work will focus on examining the interspecific differences of the synarcual morphology between extant species.

Keywords: vertebrae, synarcual, chondrichthyans, elasmobranchs, batoids, morphology, evolution

*Speaker
The resource heterogeneity determines non-pollinating fig wasps specie number.

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The resource heterogeneity determines non-pollinating fig wasps specie number.
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Non-pollinating fig wasps are generally considered to have a negative impact on fig or pollinating wasps as they parasite, inquiline or parasitoid to either fig, pollinating or other species of non-pollinating fig wasps.(G.D. Weiblen, 2002) However, most studies have focused on Ficus and pollinating wasps, or only researched in the behavior or influence of specific non-pollinating fig wasp species(A.B. Duthie et al. 2016). Non-pollinating wasps species number varied a lot among the different Ficus species (range from 1-28)(2005). According to one hypothesis, the sexual system especially the heterogeneous degree of styles inside fruit is the key trait to control wasps community as dioecious figs provides less resource for non-pollinating fig wasps to develop inside fruit compared to monoecious figs(Carole Kerdelhue and Jean-Yves Rasplus, 1996). To clarify which fig traits dominate the non-pollinating fig wasps community, we collected 76 wasps communities mentioned in peer-review papers. We also collected 11 traits that may impact fig wasps community such as fig height, leaf area, geographic distribution of ficus, sexual system such as monoecy or dioecy of fig fruits. By using GLMM and model selection, we found that the sexual system is the most important factor. There are smaller non-pollinating fig wasps community in dioecious Ficus species compared to monoecious species.

Keywords: ficus, non pollinating fig wasps, resource heterogeneity

*Speaker
Cryptic diversity under the leaf litter: flightless dance flies from Iberia are more diverse than previously known

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Among the widespread predator flies of the family Hybotidae (Diptera) there is a cluster of five species, currently comprising genera Ariasella and Pieltainia, characterised by wings extremely reduced or absent. They are endemic to the Iberian Peninsula and the Pyrenees. The study of these flies has always been hindered by their minute size (≈ 2 mm), secretive behaviour, habitat – among the leaf-litter of deciduous oak-forests – and taxonomy which is only superficially known and morphology-based.

In order to tackle these challenges, a molecular approach was applied to most of the known species in the complex as well as to newly sampled populations. A screening protocol using the 5’ end of the mitochondrial DNA gene Cytochrome-oxidase 1 (the barcode region) yielded crucial information towards the understanding of the group.

Very high levels of genetic differentiation were found among populations, unveiling a cryptic diversity not previously acknowledged. Most interestingly, an improved morphology-based analysis is largely congruent with the genetic data. The description of additional species is required to accommodate this diversity.

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Keywords: Phylogeny, Morphology, Taxonomy, Insecta, Diptera, Cryptic diversity
Phylogenetics relationships among the genus Gambusia Poey, 1854 (Actinopterygii, Poeciliidae,) in northeastern Mexican basins.

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Mexico is among the countries with the highest freshwater ichthyofauna endemisms around the world. This country counts with one hotspot in the Atlantic slope. Specifically, some authors have pointed out the region comprised by the basins of the Pánuco-Tamesí complex as a possible hotspot of numerous species. Among the freshwater ichthyofauna living there, the family Poeciliidae stands out due to its importance, being the genus Gambusia Poey, 1874 the most diverse of them all. This group has been poorly studied and all approaches have been based on morphological traits. Previous works suggested that Panuco Basin could constitute a new endemics hotspot for the Gambusia genus. Our aims were to establish the phylogenetic relationships of the genus in the Pánuco-Tamesí rivers basins as well as proposing biogeographical hypothesis that could explain the distribution of the genus in the region. To carry out the objectives, we used a multilocus approach by using two different markers (mitochondrial cytb and nuclear s7). We carried out delimitation species tests and divergence time estimations. Our phylogenetic analyses showed that the region under study presents a high divergence in the genus species as well as possible candidates to be described as new species. Lineages indentified in this study could have diversified during the orogeny uplift of Sierra de Tamaulipas and the formation of Sierra Madre Oriental during the Miocene. Sexual selection processes and climate fluctuations during the Pleistocene could have had influenced on the population structure of the species recognized on the Gambusia genus.

**Keywords:** Biogeographical hypothesis, Gambusia, Pánuco, Tamesí complex, phylogenetic analyses, delimitation species, Sierra Madre Oriental, Poeciliidae, Mexico.

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Morphological and molecular characterization of four new species of Dactylogyrus (Monogenea: Dactylogyridae) parasitizing the gills of Moroccan Luciobarbus

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The Moroccan continental water is dominated by Cyprinid fishes, 18 species have been described belonging to four genera: Luciobarbus Heckel, 1843 Carasobarbus, Karaman, 1971, Labeobarbus R’uppel, 1835 and Pterocapeta G’unther, 1902. Identification of cyprinids is very difficult because of polyploidization and intra- and inter-generic hybridization phenomena. One of the solutions, in addition to conventional methods (morphology and genetics), is to study their specific associated parasites (Monogenea), which can be used as biological markers (systematic, phylogenetic). Examination of the gill arches of the Luciobarbus species collected from different hydrographical basins in northern Morocco revealed the presence of four new Dactylogyrus species. Morphological and molecular characterization shows that three of the four new species represent cryptic Dactylogyrus and can be easily confused. Moreover, detailed examination of D. varius n. sp. reported high shape variability of the haptoral anchors among specimens of the species, three morphological forms within this species (D. varius f. vulgaris, D. varius f. magnus, and D. varius f. dromedarius) were recognized.

Keywords: Dactylogyrus, Cryptic species, Luciobarbus, Variability, Forms

*Speaker
New significant data on a vein fusion controversy documented in Stenosmylinae forewings (Neuroptera: Osmylidae)

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Among insects, the wing represents a substantial character system. Furthermore, it is the main one available for lithographic fossil record. The order Neuroptera (Holometabola) exhibits an extraordinary diversity of wing patterns that attests to an important accumulation of differentiations. Thus, the establishment of robust homology hypothesis on wing veins, determinant to investigate phylogeny and evolution of the group, raises some debates.

Currently, one of the most fruitful one concerns the veins MP (Media posterior) and CuA (Cubitus anterior, posterior to MP). Usually, MP forks in two stems : MP1 (MP anterior) and MP2 (MP posterior). However, the forewings of some subgroups exhibit a unique apparent stem MP. A first paradigm (1) suppose that MP is reduced in one stem in these wings, whereas an alternative one (2) propose that MP2 still exists but is inconspicuously fused with the vein CuA. An oblique vein between MP and CuA is interpreted in these wings as a particular cross-vein or as the base of MP2 by the paradigms (1) and (2), respectively. Due to lack of developmental and genetic knowledge on wing formation, the two hypotheses still coexist.

A comparative analysis, providing new observations and arguments, is proposed here. The intraspecific and intra-individual variability are investigated in four species (Stenosmylinae). Among three of them, some “unusual” morphologies are revealed and tend to refute the paradigm (1). Finally, a discussion is lead about the relevance of this character in phylogeny and the extrapolation of this result to other families concerned by the debate.

Keywords: Neuroptera, wing venation, vein fusion, intraspecific variation

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The hoatzin, a bird like no other

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The hoatzin (Opisthocomus hoazin) is an amazing bird. Previous research has revealed that it has a specialized leaf-feeding diet associated with an enzymatic pre-stomach digestion, unique among birds. This folivorous diet involves significant morphological changes because the leaves are digested by fermentation in an enlarged crop. This digestive system modification corresponds to an anatomical change of the sternum. The carina is reduced which leaves little space for the insertion of the pectoral muscles. Consequently, it has been suggested that the flying ability of the hoatzin is reduced.

Young hoatzins have a unique feature in birds, two claws on their wings that they use to climb. Indeed, hoatzin chicks jump from their nest into water and then climb back to the nest using their clawed wings to avoid predation. Recently obtained data for animals in the field demonstrate that the chicks move their wings with alternating movements when climbing, a locomotion mode ever observed in other species of birds.

The morphology of the Hoatzin has not been studied since the first descriptions in 19th century. The goal of the present project is to study the anatomical features of the Hoatzin thanks to new biological material that was obtained in the field in Venezuela. An ontogenetic series will allow us to describe the development of the musculoskeletal system in order to understand the evolutionary compromise between feeding and locomotion observed in this unusual bird.

Keywords: Opisthocomus hoazin, morphology, ontogeny, wing claws

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Pelvis and hind-limb muscles reconstruction in the well preserved pseudosuchian Batrachotomus kupferzellensis

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Most fossil vertebrates are known by their hard-tissue remains, bones and teeth, but inferring their soft-tissues allows us to elaborate a bigger picture of them as the living organisms they were. Several muscular reconstructions have been attempted in fossil vertebrates, but mostly focused on mammals and dinosaurs. Some insights into the muscular anatomy of the crocodilian-lineage of archosaurs were recently performed based on the pseudosuchians Poposaurus and Prestosuchus. The most striking and accurate methodology for soft-tissue reconstruction is the EPB (Witmer 1995), that combines phylogeny, muscular scars presence, and comparison with living relatives. We present here the muscular reconstruction of the pelvis and hindlimb of the pseudosuchian Batrachotomus, which presents noticeable osteological correlates of soft-tissue attachments. Most muscles were possible to infer with low speculation level. In more than one third of the attachments, the inferences were the least speculative (e.g. origins of Mm. ambiens, iliofibularis, gastrocnemius); other muscles present more speculation because the avian homologue is quite different, but their reconstruction is based on the similarity with crocodilians (e.g. Mm. puboischiotibialis, fibulares). The lower leg and foot soft-tissues present greater speculation, including some muscles unable to reconstruct (e.g. digit flexors and extensors). Differences were noted with Poposaurus reconstruction, like Mm. iliotibiales and iliofemoralis origins and M. puboischiofemoralis1 attachments. All set of differences between both taxa are likely the result of different morphological traits observed in their hard-skeleton. This muscular reconstruction will allow us to face other studies (e.g. morphofunctional) relevant to understand its palaeobiology and eventually a palaeoecological scenario.

Keywords: muscles reconstruction, pelvis, hind, limb, anatomy, EPB

*Speaker
Early Cretaceous erymid fauna (Crustacea: Decapoda: Erymidae) from France

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Erymid lobsters (Crustacea, Decapoda, Erymidae) are relatively common and abundant in Jurassic rocks (ca 70 species) but are far less common in the Early Cretaceous with about 20 species only listed in Europe, North America, South America, Australia, Antarctic, Japan and Madagascar. A study of the nine species of erymid lobsters from the Early Cretaceous of France, is here presented. Based on new observations, the concepts of some erymid genera are updated and new diagnoses are proposed for Eryma Meyer, 1840, Enoploclytia M’Coy, 1849, Palaeastacus Bell, 1850, Pustulina Quenstedt, 1857 and Stenodactylina Beurlen, 1928, mainly based on the carapace groove pattern. The new genus Tethysastacus is erected on the basis of its very simple groove pattern compared to the previous genera and includes Tethysastacus tithonius (Van Straelen, 1936) n. comb. (Valanginian, France) as type species. Four new species from France are also presented: Eryma vocontii n. sp. (Albian) which extends the stratigraphic range of Eryma to the Albian, Pustulina occitana n. sp. (Berriasian), Pustulina colossea n. sp. (Hauterivian) and Enoploclytia augustobonaee n. sp. (Barremian) which is the oldest known Enoploclytia representative.

Keywords: Crustacea, lobster, Mesozoic, new genus, new species, Western Europe

*Speaker
Lower Miocene small rodents from Napak (Uganda) and their contribution to understanding paleoenvironments.

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Abstract The Early Miocene sites of Napak (Uganda) which have been prospected by the Uganda Palaeontology Expedition since 1985, have yielded abundant fossil remains, including a rich and diverse rodent fauna. Ever since the work of Lavocat (1973) on the East African Miocene rodents, which focused mainly on the Kenyan remains, but included some material from Napak discovered by Bishop during the 1950s and 1960s, few studies have been made on the Ugandan specimens. This lack provides motivation for further study of Napak micro-mammals, especially the abundant small rodents, which were collected at four sites, Napak IV, V, XV and XXX. The fossils are attributed to 7 species representing 5 families: Afrocricetodontidae (Afrocricetodon songhori, Protarsomys macinnesi), Myophiomyidae (Myophiomys arambourgi), Thryonomyidae (Paraphiomys hopwoodi), Kenyamyidae (Simonimys genovefae, Kenyamys mariae) and Sciuridae (Vulcanisciusurus africanus). Comparison of the dentitions of extant and extinct taxa allows us to propose dietary hypotheses (granivory, herbivory and omnivory). In addition, the fossil rodents associated with other fauna from the same localities suggest a more or less dense forest environment with clearings, and the probably presence of a humid climate at the time of deposition.

Keywords: Lower Miocene, Rodents, dentition, Napak, Uganda, paleoenvironment

*Speaker
Giraffe Taxonomy: Two or Three Species Instead of Four?

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The taxonomical status of *Giraffa camelopardalis* (Linnaeus 1758) remains unchanged for the past 40 years by consisting only one species subdivided into several subspecies. Nevertheless, the number of distinct giraffe species has been highly debated since the beginning of the 19th century, leading to the description of many subspecies and up to three different species over time by considering solely morphological criteria like coat patterns, the number and appearance of ossicones and the geographic distribution across Africa. Over the last decade, several molecular studies tried to unravel this taxonomic issue. The most recent article of Fennessy and colleagues suggested the following four species: (1) northern giraffe - *Giraffa camelopardalis*, (2) reticulated giraffe - *Giraffa reticulata*; (3) Masai giraffe - *Giraffa tippelskirchi* and (4) southern giraffe - *Giraffa giraffa*. However, our separate Bayesian re-analyses of the markers used by this team reveal that the four putative species are in fact weakly supported by the data and show strong discordance between mitochondrial and nuclear results. Taxonomically, our reanalyses provide high support for the existence of rather two or three distinct giraffe species: one species including both northern and reticulated giraffes (*G. camelopardalis*), a second including all southern giraffes (*G. giraffa*) and a less supported subdivision of the latter one even into two distinct species (*G. tippelskirchi* and *G.giraffa*). Our analyses suggest as well that the evolutionary history of giraffes has been impacted by climatic changes during the Pleistocene epoch.

**Keywords:** Giraffa, species, subspecies, Africa, Pleistocene
Phylogeography and evolutionary history of the Crocidura hildegardeae complex (Mammalia, Soricomorpha)

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Within the family Soricidae, the genus Crocidura Wagler 1832 is one of the most speciose. Most of these species are from Africa and they are morphologically difficult to discriminate. Within the C. hildegardeae complex, three species are actually recognized (C. denti, C. attila and C. hildegardeae), but the validity of these species, their phylogenetic relationships and geographical distributions are unclear. To clarify these aspects, and to better understand diversification processes within this complex of species, we performed a phylogeographic study on the cytochrome b mitochondrial gene. Our results show that the complex C. hildegardeae is not monophyletic, but constitute a clade with the complex C. poensis (comprising the species C. buettikoferi, C. fozi, C. nigierae, C. poensis, C. theresae, C. turba and C. wimmeri). None of the three nominal species of the C. hildegardeae complex is monophyletic, therefore three species within this species complex. These three species have allopatric geographical distribution ranges: one is present in west-central Africa (Cameroon, Gabon, Congo, Central African Republic and eastern Democratic Republic of Congo), one is present in northern Zambia and southern Democratic Republic of Congo, and one is present in east Africa (Kenya, Tanzania, Burundi, Malawi and Zambia). Additional analyses including type specimens are necessary to verify how our findings relate to the already existing taxonomy for this group. We discuss the role of Pleistocene climatic fluctuations and rivers in the diversification of this complex of species.

*Speaker
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Keywords: Phylogeography, phylogeny, shrews, Soricidae, Crocidura, species complex, Taxonomy, Africa
Fossil turtle remains from the Early Miocene (MN4) localities of Mokra Quarry (Czech Republic).

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The two fossiliferous karst localities of Mokra-Western Quarry, Czech Republic (MWQ, 1/2001 Turtle Joint and MWQ, 2/2003 Reptile Joint) have provided a rich herpetofauna (amphibians and squamates) from the Early Miocene (MN4b). Here, we describe the unpublished turtle material recovered from above-mentioned sites, as well as two other localities of equal age including the Turtle Cave (MWQ) and a karstic fissure no. 3/2005 (Mokrá Central Quarry, MCQ), which yielded two taxa attributed to Ptychogaster (Ptychogaster) cf. buechelbergense and Testudo (Chersine) cf. angustihyoplastralis. It is noteworthy that the presence of this Ptychogasterid species was recently reported from several localities of NW Bohemia in Schaffer’s PhD, but it has never been studied in detail. In turn, Testudo cf. angustihyoplastralis represents the first known record of this taxon in Czech Republic, and in fact, it is the second record of this taxon apart from the Austrian type-locality. Regarding the taxonomical adscription of the later, our revision of the holotype of T. angustihyoplastralis further indicates that this taxon should be attributed to the subgenus Chersine. The presence of this testudinoid fauna confirms various ecological environments as a dry karst landscape with open to dense steppe vegetation inferred for the heliophile testudinid, as well as a wooded and close to freshwater environment to the semi-aquatic ptychogasterid. Finally, the turtle remains reported from the Mokrá Quarry expand our knowledge on the composition of the fossil turtle assemblages within the territory of the Carpathian Foredeep (Central Paratethys) during the Early Miocene Climatic Optimum.

**Keywords:** Ptychogaster, Testudo, Chersine, testudinoids, Carpathian Foredeep, Central Paratethys, Moravian Massif

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First record of Diplocynodon ratelii (Crocodylia: Diplocynodontidae) in the Czech Republic.

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The knowledge about the European extinct alligatoroids significantly increased during the last ten years, based on the erection of the two new species and the revision of the previously published taxa. The remains of the genus Diplocynodon are quite common in the northwest localities of Bohemian area, but they have only been referred at genus level due to the absence of skull material. Here, we report crocodylian remains from the Early Miocene of Most Basin (NW Czech Republic). Among available remains housed at the Paleontological collections of Wien University, we focus our study in two partial skulls, osteoderms and isolated vertebra. Our comparisons were based on alligatoroid taxa: Diplocynodon ratelii from the MN2 of Saint-Gerand-le-Puy (France) and the MN4 of Casots (Spain) and Diplocynodon ungeri from the MN5 of Schönegg (Austria). According to the cranial and osteoderms features, they are attributed to the Diplocynodon ratelii, which is the only taxonomically valid species from the Early Miocene of Europe. The studied remains represent the first report of Diplocynodon ratelii in the Czech Republic, where only fragmentary postcranial and osteoderms of that genus from middle Eocene to Early Miocene had been previously reported. Furthermore, the studied remains open the door to discuss the geographical and temporal distribution of Diplocynodon ratelii in Eastern part of Central of Europe.

Keywords: Fossil alligatoroids, North Bohemian area, Most Formation, coal quarry, Early Miocene, cranial anatomy

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Phylogenetics of Guinea yams and their wild relatives

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The yam genus (Dioscorea L.) comprises over 600 species. In Africa, the principle cultigens are the Guinea yams (D. cayenensis Lam. and D. rotundata Poir.). With the winged yam, originally from Asia, they are responsible for 95% of global production in West Africa and for yams being the fourth most important tuber crop in economic terms after irish potato, cassava and sweet potato.

Both guinea yams and winged yam belong to the Enantiophyllum clade of Dioscorea. Despite the economic and social importance of yam, species relationships among the closest relatives of Guinea yams are poorly understood. This is true both of the immediate wild relatives of D. rotundata-cayenensis that are still ennobled to form cultigens in some African cultures (D. abyssinica Hochst. ex Kunth, D. praeheinsilis Benth. and D. sagittifolia Pax) and more distantly related taxa with perennial tubers such as D. baya De Wild, D. burkilliana J.Miège and D. minutiflora Engl. Thus in order to recover the relationships of the guinea yams with their wild progenitors a phylogenetic analysis based on sequence data from six plastid genes using 46 accessions of Dioscorea containing 12 species making it approach species-level sampling of African Enantiophyllum was carried out. African Enantiophyllum was recovered as a monophyletic clade containing two subclades of species with annual and perennial tubers. Wild relatives in general hold genotypes that can be used to breed resilient crop varieties. We anticipate that yam breeding will also benefit from the use of enhanced knowledge of yam’s wild relatives.

Keywords: Enantiophyllum, Clade, Monophyletic, Plastid

*Speaker
Study of a complete, mostly undescribed Oise amber spiders collection reveals a surprising diversity

Benjamin Carbuccia *

Oise amber (lower Ypresian, Eocene) is among the oldest cenozoic amber deposits. While insect inclusions from this formation are well studied, spiders are still poorly known, as only one study (Penney, 2007) had been previously led on some amber samples, revealing presence of eight spider families. Present work took into account all 300 spider-bearing amber fragments registered in the collection. Inclusions got observed (after polishing) with a stereoscopic microscope and identified, when possible, to family level, based on morphological characters.

Eventually, 139 inclusions proved well-preserved enough to be determined, yielding 24 spider families, amongst which 16 are new for the deposit.

Oise amber represent oldest known occurrence for 8 of these families, and some truly interesting fossils have been discovered, like spiders preserved in mating or predatory interactions, or evidences for mimicry, phoresy and araneophagy.

In addition, this study opens very interesting perspectives, as it revealed a particular ecological and taphonomic characteristics for the amber deposit, and potentially new species and genera.

Moreover, its peculiar stratigraphic position, as one of the oldest cenozoic amber deposits, and seemingly in the very beginning of the cenozoic spider diversification, makes it really interesting to help understanding how this arachnid order overcame the Cretaceous/Paleogene mass extinction.

**Keywords:** Amber, Oise, Ypresian, Eocene, Spiders

*Speaker*
Umbelliferous pollen grains in the Oligocene and early Miocene sediments of Eastern Anatolia (Turkey) and their phylogenetic affinities

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Two decades of intensive research lead to a well-resolved phylogeny of the carrot family” (Apiaceae, Umbelliferae) but estimation of its evolutionary timescale is still problematic. Herbaceous life form of umbellifers, which drastically reduces fossilization potential, is the main reason for the lack of reliable macrofossils useful for phylogeny calibration. On the other hand, more common palaeopalynological data are commonly misidentified and formal methods of recognition are rarely in use. Oligocene and Miocene strata of Eastern Anatolian Kars-Erzurum-Muş basin where previously shown to contain the eldest palynomorphs that can be unequivocally assigned to Apiaceae. Moreover, this area has been reconstructed as potentially ancestral for multiple major lineages of umbellifers. In this study, we performed a phylogenetic analysis of molecular and morphological data in order to assign those microfossils to particular lineages of Apiaceae. Our inference was based on 154 extant representatives of umbellifers and other members of Apiales, which ancestral morphology (11 continuous and 16 categorical characters) was reconstructed on a molecular tree. Next, fossils representing four most abundant umbelliferous pollen types described from Kars-Erzurum-Muş basin were formally compared to the reconstruction and lineages with the highest affinities were identified.

Keywords: palynology, morphology, Apiaceae, evolution, phylogeny, fossil

*Speaker
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Resolving incongruence among anatomical regions for basal mammal evolution

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Solving the evolutionary history of the Mesozoic mammaliaformes and understanding the timing of their radiation is a well-studied, yet still poorly resolved. Only morphological characters, many incomplete, are available for the phylogenetic reconstruction of these early taxa. Morphological characters have always combined without taking into account of the different rates of evolution between regional partitions which can lead to biases. To identify these problems, we conducted phylogenetic analyses on different partitions for a morphological dataset from Luo et al. (2015). Partitions were selected according anatomical regions (mandibular/dental; cranial and postcranial). We showed that cheek teeth and humero-scapular characters were bringing the strongest incongruence in the placement of monotremes and multituberculates. We find that removing them from the analyses is giving stronger support in the phylogeny. Moreover, these results give better confidence for dating analyses and ancestral state reconstructions. We find a rapid diversification just after the Trias-Jurassic boundary 200 million years ago. These results emphasize the importance of the Trias-Jurassic event in the diversification of mammals.

Keywords: Mammal evolution, Phylogenetic analyses, Morphological data, Incongruence

*Speaker
Long bone histology of the aardvark 
(Mammalia, Tubulidentata)

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The aardvark (Orycteropus afer) is a large mammal endemic to sub-Saharan Africa. As an insectivore living in a semi-arid environment, it has developed a series of unique abilities, including a highly specialized fossorial lifestyle. Its anatomical and physiological adaptations linked with fossoriality, including the role of its limb bones, have been extensively described in many comparative studies. The bone microstructure of the aardvark limb bones, however, has never been studied, despite an increasing number of publications on the bone histology of mammals in recent years.

Here we describe the histology of all six limb bones in the aardvark, from transverse and longitudinal sections, with a focus on their functional role in fossorial activity for each of them. All bones show extensive remodeling during the last stages of bone growth, and display histological profiles compatible with a strong resistance to bending torsion. Most bones also present a high number of Sharpey’s fibers, corresponding to specific muscular insertions, showing a strong functional link between myology and bone microstructure.

The bone histology of the aardvark thus reflects a highly derived burrowing strategy, unique to Tubulidentata. The arrangement of secondary osteons in the outer region of the cortex differs completely from that of all other burrowing mammals, and likely reflects structural constraints linked with large body size. These preliminary results show that bone histology can reflect adaptations to fossorial lifestyle in mammals, and could potentially be used in future studies to infer burrowing strategies in fossil synapsids.

Keywords: mammal, fossoriality, bone histology, bone compactness, functional anatomy

*Speaker
New data on the Mesozoic radiation of chelonioids

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"Turtles" (Testudines) form a successful group of reptiles with several terrestrial, marine and fresh-water species. Their peculiar and somewhat constrained morphology (i.e.: carapace incorporating ribs, curved limbs, anapsid skull exempt of temporal fenestrae) and ecology has often obscured their relationships and, hence, their evolutionary history, notably in marine turtles (chelonioids). Modern chelonioids are divided in two clades (i.e.: soft-shelled turtles and hard-shelled turtles) supported by distinct morphological and embryological characters. Their origin is traced back up to the Cretaceous, along with a series of extinct forms, many of which being collectively known as Protostegidae. Fossil evidence show that at least five clades of marine turtles were roaming the seas at the end of the Cretaceous. In fact, chelonioids appeared during the first stages of the Early Cretaceous and quickly exploded to reach a high level of disparity at the lowermost part of the late Cretaceous. Therefore, the Mesozoic radiation of chelonioids must have happened during the "middle" Cretaceous (especially the Aptian-Albian interval). However this radiation is poorly understood as the phylogenetic relationships of marine turtles are not resolved yet. Bringing new data may help resolve these issues, and it is the exact reason why the genus Rhinochelys is being investigated.

Keywords: Marine, Turtle, Chelonioida, Phylogeny, Mesozoic, Cretaceous, Rhinochelys, Protostegidae

*Speaker
A model of Kinda baboon (Papio kindae) evolution and natural history: morphological consequences of feminization in the craniofacial skeleton

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Baboons (genus Papio) are large-bodied, terrestrial Old World monkeys that are widely distributed across sub-Saharan Africa and the Sinai Peninsula. They are characterized by body size sexual dimorphism, with males nearly 1.5 times larger than females. Additionally, males have extremely large canines and a correspondingly prognathic snout. However, one species, the Kinda baboon (P. kindae), differs from the others in demonstrating a reduction in these characteristically "baboon" traits. Unfortunately, Kindas are less well studied than other baboons. The long-term research camp in Kasanka National Park (KNP), Zambia established by AHW is the first to provide longitudinal quantitative data on Kinda ecology and social behavior. These data (reported previously) suggest Kindas differ greatly from other baboons, primarily in their social behavior. To augment these behavioral observations, we present preliminary results from a craniometric study on specimens from the KNP populations. Eight male skulls were collected opportunistically in the field and individuals range in age from juvenile to adult. Twenty-five linear measurements were recorded with calipers to quantify craniofacial size and shape variation. These data were integrated into a large analysis (N = 985) of other baboons that compares the distribution of craniofacial variation across multiple species, sex, and age cohorts. Small sample size and the absence of any female specimens precluded any statistical inference but exploratory data analysis methods were employed and observed patterns were used to formulate a model to potentially explain the differences in behavior and social structure in Kindas as compared to all other baboons.

Keywords: baboons, craniofacial, anthropology, Zambia, monkeys, variation

*Speaker
Ungulare remains from the middle and upper Pleistocene cave sediments of the Cracow - Czestochowa Upland in relation to Europe

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The Cracow-Wieluń Jura is the part of Poland with the greatest number of caves and rock shelters. The most recent estimate is 2000. Vertebrate remains were found in 38 upper Pleistocene and Holocene localities (caves and rock shelters). The fauna was dominated by birds (200 taxa) and mammals (13 taxa).

In the Cracow-Częstochowa Upland there are no fossil-bearing localities from the early Middle Pleistocene. The reasons may be glaciations which in that period occupied the Cracow-Wieluń Upland. The earliest fossil records from the dates from the beginning of the Odra glaciation (Saalian). During cool periods the fauna was cold-loving, including typical taxa of the so called mammoth steppe, adapted open areas; they were characteristic also of later periods of the Pleistocene. Repeated migrations of steppe or tundra-associated forms and montane species took place. Characteristically, even during the coldest periods forest taxa or taxa associated with dense vegetation were present in the area. The constant presence of forest fauna throughout the Vistulian is a distinguishing feature of the Częstochowa Upland. Only the number of forest species and their proportion in the fauna varied. The area constituted a local refugium for the forest fauna during the last glacial. At the end of the last glacial the environment was much drier than in the previous periods, especially in the LGM. At the end of the Pleistocene to early Holocene the megafauna became extinct, while other species of the steppe, tundra and mountain retreated.

Keywords: ungulata upper Pleistocene Europe Cracow, Częstochowa Upland Poland

*Speaker
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Hide and seek: The complex evolutionary history of green secondary plastids

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Photosynthesis in eukaryotes arose from the endosymbiosis between a cyanobacterium and a heterotrophic host. This primary endosymbiotic event gave rise to Archaeplastida, a supergroup composed of glaucophytes, Viridiplantae (Green algae and land plants) and Rhodophyta (red algae). In their turn, red and green algae established secondary endosymbioses spreading the ability to photosynthesize to other eukaryotic groups. During endosymbiosis, multiple genes of the alga were relocated to the host nucleus (Endosymbiotic Gene Transfer, EGT). Through the phylogenetic analyses of 85 EGT genes, we showed that extant phyla with green-alga derived plastids (chlorarachniophytes and euglenids) likely carried a red plastid that was later replaced by a green one. We propose that the former red plastid might have helped to establish the secondary endosymbiosis with a green alga.

Keywords: Plastid evolution, endosymbiosis, algae

*Speaker
Wet behind the ears? Underwater Directional Hearing in Protocetids

Mickaël Mourlam *

Extant cetaceans are fully aquatic mammals which present deep modifications of their sensory organs, especially of the sound perception pathway. The archaeocetes, a paraphyletic assemblage of early diverging cetaceans, present a diversity of morphologies of the middle ear, documenting a variety of sound transmission mechanisms from a mostly terrestrial configuration to a fully aquatic layout. Protocetids are semi-aquatic archaeocetes known from the middle Eocene deposits. The auditory region of these so called "transitional" forms is only partly apprehended. Lutetian phosphate deposits of Kpogamé, Togo (46 - 43 Ma) yielded abundant material documenting the auditory region of protocetid whales including isolated bullae, petrosal and a skull fragment preserving a subcomplete petrotympanic complex. Detailed study of this material led us to reassess the original taxonomic attribution of these middle ear remains, first entirely attributed to *Togocetus traversei*, and to identify, on the basis of new bullar and petrosal characters, three different protocetid taxa: *?Carolinacetus* sp., *Togocetus traversei*, and a Protocetid indeterminate (morphotype γ). CT-Scan investigation of the in situ petrotympanic complex reveals that protocetids retained a complete tympanic ring similar to that of terrestrial artiodactyls. Furthermore, the involucrum could probably articulate with the medial side of the ventral surface of the petrosal. Here, we will discuss the implication of this articulation, absent in fully aquatic cetaceans, and propose a new hypothetical hearing mechanism, that consists of a bimodal functioning of the petrotympanic complex allowing optimal directional hearing in both air and water in amphibious early cetaceans: the "Petrotympanic Switch Mechanism".

**Keywords:** Archaeoceti, Protocetidae, Petrotympanic complex, CT, scan, Hearing mechanism

*Speaker*
SEBKHA OF GUERAN IN THE MOROCCAN SAHARA: A SPECTACULAR TESTIMONY OF THE HISTORY OF THE EVOLUTION OF CETACEANS

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New archaeocete whale faunas are recently described in the Eocene Priabonian from Boujdour area in southwestern Morocco. These fossils belong to species of Archaeoceti, ancient sub-Order and now extinct from the Order of Cetaceans. They represent the first stages among the most important stages of evolution of cetaceans as marine mammals from terrestrial mammals, the Artiodactyla.

The Bartonian archaeocete fauna comes from the Sebkha of Gueran, is a depression located in the middle of the Moroccan Sahara about 125 km southeast of Boujdour. The presence of the Protocetidae family and the Basilosauridae family, as well as the Indo-Pakistani site and Wadi al-Hitan sites in Fayum in Egypt, make it one of the largest and most important sites in the World testifying to the early stages of cetacean evolution.

Eight genera and species of archaic whales are present in the fauna from the Aridal Formation at Gueran. Three of the archaeocete species represent semiaquatic Protocetidae and five species are aquatic Basilosauridae. Protocetids are characteristic of Lutetian lower middle Eocene strata, and basilosaurids are characteristic of Priabonian late Eocene beds. Protocetidae are represented by a small protocetid; a middle-sized protocetid; and the large protocetid Pappocetus lugardi. Basilosauridae are represented by a small basilosaurid Chrysocetus Fouadassaii; a larger basilosaurid Platyosphys aithai; the large basilosaurid Eocetus schweinfurthii, Cf.Masracetus markgrafi and Cf. Dorudon atrox .

The fauna also includes abundant Selacian teeth, remains of fish, turtles, crocodiles, birds and proboscidiants interesting for the reconstitution of the palaeoenvironment.

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**Keywords:** Archaeocete whale, Eocene Priabonian, Boujdour southwestern Morocco, the Proto-cetidae, Basilosauridae.
Systematic reassessment of the earliest mammalian fauna (Saint-Nicolas-de-Port, Upper Triassic, France)

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The locality of Saint-Nicolas-de-Port (Upper Triassic, France) yielded the most important collection of earliest mammaliaforms. This collection includes more than three quarters of the available material for Triassic mammaliaforms, with representatives of all groups (morganucodonts, ‘symmetrodonts’, and haramiyids). However, despite twelve publications between 1978 and 1999, most of this material remains undescribed. After description of more than 450 molariform and premolariform teeth, 18 species and three indeterminate taxa are identified. Among morganucodonts, several genera known in other sites are described (Morganucodon, Paceyodon, and Paikasigudodon). Two new species are described (Megazostrodon chenali sp. nov. and Rosierodon anceps gen. et sp. nov.). Upper and lower molariforms of Brachyzostrodon are associated for the first time. Among ‘symmetrodonts’, one new species of Kuehneotherium, K. stanislavi sp. nov., and a new genus of Kuehneotheriidae, Fluctuodon necmergor gen. et sp. nov., are described. Woutersia is revised. The hitherto unknown upper molariforms of Delsatia are identified. Among haramiyids, the description of the material referred to Thomasia demonstrates the need for an exhaustive revision of the genus. Theroteinus is revised, with the erection of a new species, T. rosiereiensis sp. nov. This study raised several issues on the systematics of earliest mammaliaforms, especially on definition of key taxa.

Keywords: Mammals, teeth, Upper Triassic

*Speaker
Phylogenomics on the origin of eukaryotes

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The differentiation between prokaryotes and eukaryotes is probably the most important structural separation in the history of life. Among the eukaryotes we find a broad biological diversity that encompasses unicellular and multicellular, autotrophic and heterotrophic lineages. In fact, a large part of the eukaryotic biological diversity, especially that of protists, still remains to be discovered. The systematics and taxonomy of eukaryotes have undergone a great transformation with the appearance of molecular biological techniques, such high-throughput sequencing and single cell genomics. Because of these, several lineages of eukaryotes have been discovered and new clades and groupings have been created. But still many incertae sedis protists remain understudied (Apusomonadida, Ancyromonadida, Breviatea, Malawimonads, Rigifilida, Collodictyon, etc.). Also, the origin of the eukaryotic cell and the location of the root of the tree are the objects of intense scientific debate. Recently, molecular environmental studies such barcoding and metagenomics have provided the tools to discover prokaryotic lineages close to the root of eukaryotes (such as the Lokiarcheota), with gene contents previously thought to be eukaryotic innovations. The tree of life is in a continuous process of restructuring and needs to be resolved to infer such important evolutionary transitions, and trace back the original features of the Last Eukaryotic Common Ancestor. Molecular phylogenomics is one of the most reliable methods to resolve such questions, that will establish a framework to test eukaryogenesis hypotheses.

Keywords: concatenated matrix, single cell genomics, endosymbiosis, protistology, eukaryogenesis

*Speaker
The exceptional finding of Stephanorhinus sp. (KRETZOI, 1942) from site Gorzów I, Poland

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In may 2016, sediments of a paleolake, reaching 11 m in thickness were exposed during the construction works of the S3 route in Gorzów Wielkopolski. The sequence of sediments (two layers of gyttja separated by peats and fluvial sands and muds) reflects multiphase development of the lake. Odranian (Saalian) glaciofluvial deposits are overlain by lacustrine sediments which, in turn, are covered by Weichselian glacial sediments. At present it is possible to determine the stratigraphic position of the palaeolake as the Eemian with the probable continuation of sedimentation in the early Weichselian. In the sediments of an ancient lake, remains of a rhinoceros were discovered – an almost complete skeleton (more than 100 bones), including skull with 24 well-preserved teeth. The preliminary expertise, based mainly on the teeth analysis, allows to recognise the genus as Stephanorhinus (Kretzoi, 1942). Finding of such a complete and well-preserved specimen of this genus in situ is unique on the scale of Europe. Besides the rhinoceros remains, a single metacarpal bone of fallow deer (Dama dama L.) was also found. This is the first fossil occurrence of the species in Poland. The sediments were sampled and a multiproxy reconstruction of the history of the basin’s development is planned. The association between the rhinoceros and the fallow deer remains and the fully documented excavation context provide an opportunity to ascertain the conditions in which the animals lived in higher latitudes during the Eemian interglacial.

Keywords: Stephanorhinus sp. Poland

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Origin and early diversification of Caviomorpha (Rodentia, Hystricognathi)

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Despite their modern, Neogene and late Paleogene high diversity, the early evolutionary history of caviomorph rodents has long remained obscure. Until recently, the majority of Paleogene caviomorph assemblages has remained from high latitudes of South America (11/18) and only very few are known from lower latitudes (4/18). Recent field expeditions in Peruvian Amazonia have led to the discovery of more than twenty new caviomorphs-bearing localities in the regions of Contamana and Tarapoto. They document three South American Land Mammal Age of the Paleogene: Barrancan (late Middle Eocene; Contamana), Tinguirirican (Early Oligocene; Tarapoto) and Deseadan (Late Oligocene; Contamana). For the Barrancan, the caviomorph record has so far remained virtually undocumented. The systematic study reveals the presence of several new taxa. A cladistic assessment of the dental and cranial evidence was undertaken to investigate and formalize the phylogenetic positions of these new taxa in a high-level caviomorph phylogeny. A matrix was assembled in observing/describing 514 characters through a comprehensive taxonomic sampling (106 taxa) including extinct (a maximum of Paleogene taxa and several Neogene taxa) and extant (representatives of each family) species. The results show that these new taxa are either stem Caviomorpha or stem representatives of the extant superfamilies (Cavioidae, Chinchilloidea, Eretthizontoidea, and Octodontoidea). This phylogenetic context highlights the timing of the caviomorph superfamily cladogeneses.

Keywords: Peruvian Amazonia, Contamana, Tarapoto, Paleogene, phylogeny, adaptive radiation

*Speaker
Sciuriform limb bones: morphological adaptations to different locomotor behaviors

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Sciuriform rodents evolved a variety of habitat related locomotor behaviors, with arboreality representing the plesiomorph condition, while semi-fossoriality and gliding evolved at least two times independently. This makes them an interesting clade for studying locomotion related morphological adaptations. We are looking for adaptations in scapular and femoral morphology. Both skeletal elements play an important role for the generation of propulsion and in digging behavior. Previous investigations suggest differences in attachment sites of limb retractor muscles. For example, the scapula of non-sciuriform digging mammals is known to display a well-developed teres major attachment site. We use geometric morphometrics in combination with phylogenetically informed methods to analyze the complex shape and evolution of these limb elements. Bones from about 190 species are investigated. We use a MANCOVA to check for significant shape differences between locomotor groups while taking into account allometric and phylogenetic effects assuming a Brownian motion model of evolution. The femur displays a higher adaptive signal than the scapula, letting assume that the propulsive function of the hind limb is under stronger selective pressure regarding locomotor performance. However, our assumptions regarding adaptations in muscle attachment sites are only partly confirmed. As predicted by previous publications, the attachment site of the hind limb retractor gluteus maximus is relatively smaller in fossorial species. But unexpectedly, this is the case for the teres major fossa, too. This illustrates the necessity to investigate the interplay between form and function using experimental set-ups to fully understand morpho-functional adaptions.

Keywords: Sciuromorpha, rodents, locomotion, morphology, adaptation

∗Speaker
Getting a handle on the transition from limb to fin: first description of the forelimb of a African protocetid.

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Cetaceans constitute a textbook example of secondary adaptation of tetrapods to aquatic life. This major event in the evolutionary history of mammals is often linked in literature to the transition from a limb to fin. However, limb bones are scarce in the fossil record of early cetaceans, and the transition from a limb adapted to an amphibious life to a fin adapted to a pelagic lifestyle remains poorly documented. The Protocetidae were the most diversified archaeocetes in terms of size and forms, and displayed a wide array of locomotor lifestyles from the amphibious basal forms to species fully adapted to pelagic life. Several authors proposed that they were not nearly as sophisticated swimmers as extant cetaceans, probably swimming by undulation of the body and tail or using alternate or simultaneous hind limb paddling. The discovery of new protocetid remains in Lutetian deposits in Senegal, including an almost complete forelimb, allows us to take a new look at this crucial step of the cetacean morphological evolution. The new remains were CT scanned and 3D models of the forelimb were performed. A morpho-functional study allowed us to compare the locomotory abilities of this specimen with that of other marine mammals. The mobile articulation of the elbow and the large muscular insertions on the pisiform bone and on ulna’s olecranon show that the Senegalese protocetid used its forelimbs as powerful propellers during locomotion, a situation that recalls the one observed in extant Otariidae but contrasts with that of modern cetaceans

Keywords: Forelimb, Protocetidae, Senegal, Lutetian, Morphological evolution

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Molecular diversity of dicyemids and chromidinids, parasites from the renal appendages of cephalopods: how multiple parasitic infection can drive diversity assessment?

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The renal sacs of cephalopods are an unusual habitat for two phylogenetically distant parasites, dicyemid mesozoa and ciliate chromidinids. Their systematic was mainly based on morphological criteria and little is known about the molecular diversity and their phylogenetic position is uncertain.

We have undertaken to study these two groups diversity to obtain more elements for the comprehension of their systematics and phylogeny.

Starting from a large sample of cephalopods from the Atlantic Ocean and the Mediterranean Sea, we characterized these parasites morphology and molecular diversity (analyses of the 18SrDNA marker).

In our samples, the prevalence of chromidinids was weak. We were able to describe two new species and we obtained for the first time molecular data from the 18SrDNA marker. The robust phylogenetic analyses show that chromidinids are positioned within the apostome ciliates, belonging to the Oligohymenophorea class.

The prevalence of dicyemids was high (88%). A major problem in the dicyemid systematics is that a large number of named morpho-species are based on incomplete morphological descriptions, entailing ambiguities in their identification. We therefore redescribed all development stages of some dicyemids. Phylogenetic analysis (18SrDNA marker), allowed us to define 10 robust clades. The morpho-species are not distributed in a non ambiguous manner within these clades. This leads to the question of the relevance of the 18SrDNA marker. It also challenges the relevance of morphological criteria currently used for the dicyemid systematics and multi-infection impact.

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Keywords: molecular diversity, dicyemids, chromidinids, phylogenetic position, 18SrDNA, cephalopods
Megaloolithid dinosaur eggs: scrambled parataxonomy and nesting strategies

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The detailed study of fossil dinosaur eggshells from Upper Cretaceous continental deposits from the Hațeg Basin (Romania), the Arc Basin and Argentina and from the Thanetian of the Rians Basin (France) was made in order to test the robustness of fossil eggs’ parataxonomy and to reveal novel data on dinosaur palæobiology. µXRF, XRD and cathodoluminescence analyses attest a limited diagenesis on these fossils, which allow interpreting observed traits from a palæobiological point of view. According to their microstructure, analysed eggs mainly belong to the titanosaur-related Megaloolithidae oofamily. Measured histological variables analysed through PCA – clustering unveil a weak megaloolithid parataxonomy scheme which needs to include whole shell units morphology forming the eggshell in addition to descriptions. XRD analyses point to an almost pure calcite eggshell composition (LMC) as well as a preferential orientation of this calcite along the shell unit growth axis, the latter involving biomechanical properties of the egg. Water vapour conductance (GH2O) estimation of some fossil eggshells together with the corresponding porosity – modelled mass pairs suggest that Hațeg and Arc Basins titanosours burrowed their nest in humid conditions. The vegetation-mount hypothesis is rejected whereas a hydrothermal environment is proposed for the Argentinian sample.

Keywords: Megaloolithidae, titanosaur egg, parataxonomy, nesting strategy, Hațeg Basin, Arc Basin

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Earth and Planetary Sciences
Architecture of Côte d’Ivoire onshore sedimentary deposits: structure and stratigraphy

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We present here the sedimentary deposits architecture of Ivory Coast onshore basin. For this study, we interpret the seismic profiles resulting from 3 seismic reflexion campaigns and data of 13 drillings. The structural studies starting from the interpretation of the seismic data show there the presence of a major accident called "fault of the lagoons" crossing all the zone and of the presence of several fracturings whose direction is NNW-SSE. These studies led all the same to the description of the presence of a graben on the left and a depression separated on the right from a horst with Adiadon. The analysis of the data of well shows that the stratigraphy of the onshore goes from the Albian (106 - 100 million year) to quaternary (10 - 6 million year). The sediments of Albian age are consisted argilo-sandy deposits. As for the sediments of the higher Cretaceous, they are consisted by fine sands with coarse, the argilo-carbonated series and the sandy or sablo-argillaceous series. For the sediments of the tertiary sector and the quaternary one, the formations met are made up of clays, fine sands, conglomerates and gravels. The correlation of structural and stratigraphic information shows that the tanks of the onshore would consist of sands and sandstones located in the formations going of the Albian in Maastrichtian in the traps of the stratigraphic type, structural type or structuro-stratigraphic type. This correlation indicates that the base is less deep in the east of the basin onshore.

**Keywords:** Onshore, seismic profiles, Cretaceous, Albian, fault of the lagoons, Côte d’Ivoire

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GEOCHEMISTRY OF OUED AMIZOUR IGNEOUS ROCKS (BEJAIA, EASTERN ALGERIA)

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The igneous rocks of Oued Amizour are part of the North African magmatic province which belongs to the Maghrebides chain, the south part of the peri-mediterranean alpine belt. A large Zn- Pb deposit lies in the calc-alkaline volcanic rocks of this region. The orebody is hosted in andesites of the lower unit, and sometimes in the metasomatized dacitic unit.

The geochemical study of the major elements shows a very clear separation between the rocks of lower unit and those of higher unit. This geochemical discrimination of the volcanic rocks into two groups (lower unit and higher unit) is confirmed by the study of trace elements. Rocks of Oued Amizour show series of calc-alkaline affinity and an implement in the volcanic arc and syn-collision environments. Normalized spiderdiagrams in the primitive mantle have a very similar and typical overall look of orogenic calc-alkaline magmatism. They show negative anomalies in Ba, Ti and P and positive anomalies in Rb, Th and Zr. Spectra normalized REE chondrite show that all the studied rocks are enriched in light rare earth elements (LREE) relative to heavy rare earth elements (HREE). They are characterized by positive Eu anomalies characteristic of adakitic magmatism.

Keywords: Oued Amizour, volcanic rocks, calc, alkaline magmatism, (Zn, Pb) mineralizations

*Speaker
Copper, lead, zinc and barite mineralizations of the Eastern Anti-Atlas, Morocco

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The Moroccan Anti-Atlas, located at the northern border of the West African Craton (CWA), is composed of a Proterozoic Pan-African basement overlain by Post-Panafrican Uppermost Proterozoic and Palaeozoic rocks, deformed during the Variscan orogeny. The Precambrian terranes of the Anti-Atlas are formed by two distinct assemblages: i) an ancient Paleoproterozoic substratum (~ 2 Ga), structured during the Eburnian orogenesis and ii) Neoproterozoic cover associated with the Pan-African cycle (800 - 560 Ma). A suture Pan-Africain intituled Major Fault of the Anti-Atlas separate the cratonic western Anti-Atlas from the mobile Eastern Anti-Atlas. The Eastern Anti-Atlas hosts a large kind of mineralizations of precious-metals (Au, Ag...), base-metals (Cu, Pb, Zn) and industrial minerals (barite, fluorite, pyrophyllite...). It contains a number of giant deposits such as Imiter (Ag-Hg), Tiouit (Au-Cu), Boumadine (Cu-Pb-Zn-Au-Ag) and Tafilalet (Cu-Pb-Zn-Ba).

A set of early studies attribute the mineralization of the Anti-Atlas to hydrothermal events related to strong extension tectonics and Late-Neoproterozoic magmatic events, but several recent studies attribute this mineralization to Triassic rifting events.

The mining district of Tafilalet is located in the oriental part of the Eastern Anti-Atlas, and consists of Paleozoic formations that hosted numerous base metals and industrial minerals. Several famous deposits are located in this region, such as M’Fis, Cha’ib Ras, Boumaiz, Tijjekht, Ras Kammouna and Tadaout. This latter comprises a lot of veins of Cu, Pb, Zn and Barite, with a NE-SW direction.

**Keywords:** Anti, Atlas, Neoproterozoic, Mineralizations (Lead, Zinc, Copper, Barite), Hydrothermal, Morocco

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CARTOGRAPHY OF THE HYDROGRAPHIC NETWORK; EFFECTS ON THE STRUCTURE OF THE PLATE OF KEM-KEM (SW ALGERIA).

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The Cretaceous plate of Kem-Kem of Cenomanian-Turonian age, is an important rock, tabular, semi-desert plate. Located in the southern part of the Basin of Doura.

The shredded aspect of this plate is due primarily to the unfavorable climatic conditions of the area and the long periods of believed of Daoura wadi, which caused a dislocation of the hydrographic network; but also with the nature of the grounds which are continental deposits "liking-sand-clays", not very resistant and which facilitates a strong erosion of the relief. It can be also due to the zones of weakness "faults" which would affect the plate and which would facilitate its erosion.

With an aim of defining the share of the structuring post-Cretaceous which affected the plate of Kem-Kem, a cartography and an analysis of the hydrographic network have been carried out.

The various directions which show us the tracing map and the hydrographic network obtained of the plate of Kem-Kem are for major the part concordant. The most important directions are NW-SE, N-S and the ESE-WNW. These preliminary results militate for the idea of recurrent faulting of the old accidents which have, certainly, guided Hercynian tectonics of the chain of Ougarta.

The detailed analysis of braided hydrographic network shows for the first time, a NW-SE shift of accidents, for the majorities, and a NE-SW direction for waterways.

Keywords: Kem, Kem, Cenomano, Turonian, cartography, hydrographic network.

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THE ROLE OF ARID ZONES EROSION IN THE DISSEMINATION OF METALLIFEROUS TRACE ELEMENTS (ETM) ” Case of Bas-Drâa Basin; Occidental Anti-Atlas of Morocco”

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This study Highlights the effect of arid climate in the increase of ETM liberation from mining wastes and there accumulation/transfer in sediments, which causes various impacts on the quality of the environment. The high activity of wind erosion and occasional hydrous flood erosion in the studied area is the main processors of Metalliferous Trace Elements (ETM) release and transport, from the exposed mining wastes located in the upstream of Bas-Drâa basin, to its downstream (Drâa river). The high capacity of wind and water transportation is the result of the interaction of several factors, such as wind direction, sediments nature, geo- morphology system, rainfall rate, etc..., who interact in a series of geochemical and physical processes, which control by their turn the ETM diffusion in sediments and water pollution. Stream sediment samples were collected at the watercourse to determine the degree of contamination of trace element (Cd, As, Pb, Zn, Cu, and Cr), their spatial distribution in rivers and their effects on sediment quality. The spatial mapping represented in this study is carried out using the Geographic Information System (GIS), who enabled us to trace the ETM scattering and limiting the polluted area. The results reveal significant concentrations of cadmium (Cd), which covers the entire surface sampled with an average value of 10 ppm, which remains above the AFNOR’s standard for cadmium (Cd = 2ppm) in setream sediments. It appears that the sediments show an average accumulation/pollution (Igeomoy. = 2.52) and a considerable degree of contamination (DCmoy ≥12) in the total area.

Keywords: Mining Impac, Bas Drâa, erosion, Arid zone, Climate, Environment

*Speaker
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Paleoclimate reconstruction during the last two millennia in Morocco from high resolution speleothem records

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Two well dated speleothems oxygen isotope (δ18O) records sampled from Chaara cave in Northeastern Morocco are used to investigate variations in hydroclimate conditions during the last 2000 years. The new results shown in this work bring complementary proxies that confirm the previous North Atlantic Oscillation (NAO) reconstructed index during the last millennium and deliver new implications concerning its evolution extending back to Roman Warm Period (RWP). Our high resolution δ 18O records provide evidence of centennial and decadal variations that correlate with Mg and Sr paleorecords obtained from a speleothem at Piste cave, indicating regionally coherent variability during the last Millennium in the Northeastern Morocco. Evidence of dry conditions exist during the Medieval Climate Anomaly (MCA) period and the Climate Warm Period (CWP) and humid conditions during the Little Ice Age (LIA) period. Comparison with paleorecords indicates that the changes in moisture are mostly driven by the NAO. Persistent positive and negative NAO conditions dominate the MCA and LIA respectively. In addition, our results highlight new evidence of the NAO evolution to beyond the last 1000 years. Positive NAO conditions recorded during the MCA persist crossing the Dark Age Cold Period (DACP) and negative NAO conditions seem to explain the negative trend of isotope values in the beginning of the RWP.

Keywords: Speleothems, oxygen isotope, Morocco, Hydroclimate, NAO

*Speaker
STRUCTURAL ANALYSIS AND PETROPHYSICAL PROPERTIES OF THE BARREMIAN SANDSTONE-CALCAREOUS BAR IN AGADIR-ESSAOUIRA BASIN (MOROCCO) FOR HYDROGEOLOGICAL EXPLOITATION.

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The Barremian sandstone-calcareous bar in the Agadir Essaouira basin, with a thickness of 30 meters, is potentially the best reservoir in the Lower Cretaceous units. This study, based on a multi-disciplinary approach, aims to investigate the Barremian reservoir using structural analyses, petrographic and petrophysical characteristics. Petrographic studies showed that sandstones are characterized by mineral precipitation, dissolution and dolomite crystals replacing carbonates cement. Petrophysical measurements showed a primary permeability and porosity of about 50 to 1000 mD and 8 to 23 % respectively. Detailed fracture analyzes identify a major set of N105-130 direction and minor set of N20-30 direction in the North and the South flanks respectively in the South Atlasic fold, while the North Atlasic fold showed a major set of N80-100 direction and a minor set of N0-15 direction. The Barremain fractures are similar between the two synclines with an average of 11 fractures/m2. The general dip is towards the west, suggesting a flow direction in the reservoir towards the ocean. The results show that the Barremian unit is controlled by the early sedimentological processes of the clastic units and the intense fracture network enable water to circulate within fractures increasing the porosity. Chemical water analyzes reveal that the groundwater is enriched on (Ca2+ + Mg2+) and SO42- due water/rock interactions.

Keywords: Barremian, reservoir, syncline, fractures, permeability, groundwater.

*Speaker
The pelites of Tangier unit: wealth, in balancing view ”using-vulnerability” on industrial and geotechnical planning.

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The pelites of Tangier (extern Rif belt) are associated with a spectrum containing essentially clay, the torque kaolinite-dickite, illite, interbedded illite-smectite and palygorskite. The smectite is added in non negligible proportions to the superficial hydrolyzed horizons (0.5 to 10m under the ground). Moreover, the sedimentary amorphous silica recrystallized in the torque C-T (Christobalite-Trydimite) under the effect of diagenesis and/or tectonic constraints. Our sedimentological and stratigraphic study of Tangier’s mudstones leads us to consider it a geological wealth with exceptional properties. The pelites Meet the technical requirements for the production of cement thanks to the richness in alumino-silicates, poverty in Mg and to the low developed silica of type opal-CT (assimilated in the rafters of calcium clinker) and Amortize the blows of Public Works Buildings (PWB) investment projects, during earthworks, the digging of the foundations and the opening of channels of regional transport (roads, LGV). When they are cleared on these shipyards, pelites are recyclable in the brick. When their digging produces stratigraphically underlying phtanites, this last lithofacies is immediately used for the production of cement.
For the moment, the usage balance - vulnerability of Tangier’s pelites is considered already to be switched to the side of geomateriel in presence multiple uses.

Keywords: geomateriels, pelites, clay minerals, Tangier unit

*Speaker
PHOSPHATE MINERALIZATION OF DJEBEL KOUIF (ORIENTAL SAHARIAN ATLAS, ALGERIA):
SEDIMENTOLOGICAL AND PETROGRAPHIC CHARACTERISTICS

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The Djebel Kouif located in the Tébessa region is known for its mining potential, testified by important Paleocene-Eocene phosphorite accumulations. It is constituted by sedimentary formations of the Maastrichtian up to the Quaternary. It represents a perched syncline with an Eocene core, in which the phosphorite bed is at the bottom of the Thanetian limestone formations (Flandrin, 1948).

On field, the macroscopic description shows phosphate beds intercalated by marl and carbonate formations with chert intercalations. Particle size analysis of the sandy phosphorite with clayey cement reveals heterometric phospharenites deposits generally poorly to moderately sorted. These results indicate sedimentation in a rather quiet to agitated environment. With optical microscope, the petrographic study of collected samples allowed characterizing a main sedimentation phase, mainly represented by pellets (without nucleus and/or with nucleus) phosphate rich in organic matter, coprolites, lithoclasts, bioclasts, oo’ides and incidentally silica, glauconite and dolomite.

Keywords: Coprolites, phosphorites, phosphate mineralization, pellets, Paleocene, Eocene.
Seismic reflection imaging of active faults and their tectonic behavior in the South Alboran Basin since Late Miocene

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The study of 1000 km seismic reflection profiles, along the Northern Moroccan margin, allowed browsing new imaging in details about the regional geological structures and their functioning. To achieve this goal, we elaborated a high-resolution depth model and a global tectonic sketch. The influence of recent tectonic activity is manifested by normal and strike-slip faults, trending mainly N70° and N125°. In this segment, the Nekor strike-slip fault seems to be connected to a secondary major fault system that changes behavior to left-lateral strike-slip fault with normal component. Analysis of local seismic activity recorded from 1990 to 2014 with moderate magnitudes activity shows alignments in clear superposition with the detected active faults in seismic reflection lines. Furthermore, a 20km pulling down of the coastline has took place at the end of the Messinian Salinity Crisis.

Keywords: Active tectonics, Nekor fault, Seismic reflection, Seismicity, Alboran Se, Rif belt, Morocco.

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Eocene dinoflagellate cysts from the Ibn Batouta section, Tangier region, westernmost External Rif, Morocco: biostratigraphy, paleoenvironments and paleoclimatic information

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Our palynological investigations of Eocene sediments from the Ibn Batouta section, located in the external Tangier Unit (western External Rif, northwestern Morocco), revealed the presence of well-preserved figured organic matter, rich in dinoflagellate cysts. Qualitative and quantitative analysis of palynological content, mainly dinoflagellate cysts, allowed a biostratigraphic subdivision and a paleoenvironmental reconstruction of these deposits. The dinoflagellate cyst events used for the characterization of the Middle Eocene in the lower part of the Ibn Batouta section are: the first and last appearances of Castellodinium compactum, Distatodinium craterum, Distatodinium ellipticum, Distatodinium pilosum, Phthanoperidinium geminatum, Polysphaeridium biformum, Rhombodinium spinula, Ynezidinium brevisulcatum, the first appearance of Homotryblium floripes and the last appearance of Hystrichokolpoma bullatum. The disappearance of most of these species and the last appearance of Deflandrea phosphoritica are used for deduction of an Upper Eocene–Lower Oligocene age for the upper part of the section. Relative abundance changes of selected dinoflagellate cyst groups and continental palynomorphs allowed to highlight, in ascending order, five different marine environments: (1) neritic coastal with important nutrient availability at the base of the section; (2) outer neritic at the beginning of a transgressive phase in the Lutetian; (3) deeper outer neritic to oceanic in full transgressive phase in the Bartonian; (4) probably shallower outer neritic at the beginning of a regressive phase in the upper Bartonian; (5) coastal, probably estuarine in full regressive phase in the Upper Eocene–Lower Oligocene interval. These paleoenvironmental changes coincide with the global climate changes of the Middle Eocene Climatic Optimum (MECO).

Keywords: Eocene, Dinoflagellate cysts, Biostratigraphy, Paleoenvironments, Ibn Batouta section,

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Earth conductivity imagery: using Full Maxwell FDTD modelling to study the transient response of custom-made Tx and Rx coils.

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From airborne applications to field scale measurements of Transient Electromagnetic Methods (TEM), an accurate knowledge of the sensitivity of the inductive coil sensors (system response) is a prerequisite to interpret the measured transient magnetic flux density into a distribution of the electrical conductivity of the subsurface. The system response is a term that refers to the cumulative effect of inductive and capacitive couplings (cross-talks) between each component constituting a TEM apparatus and the nearby conductive structures. As a result, the frequency sensitivity of the voltage coil sensor (Rx) along with the emitted current waveform in the current emitting coil (Tx) are controlled by the geometry and electronic characteristic of the set-up as well as the near surface electromagnetic properties. During the early development of an innovative airborne TEM solutions (French national TEMas project), determining the coil geometries and the impedance matching between all parts of the transmission link (electronic parts and coils) for various environmental set-ups, has been a major issue. In this study, we review the required theoretical framework and propose a versatile numerical methodology to ease the coil design and impedance matching process while extending our understanding of short-time transient that operates from DC to moderately high frequencies (0 to 20 Mhz). We used a full Maxwell equations FDTD model along with a semi-analytical 1D modeler to infer coils emitting and receiving properties. Strategies regarding the impedance adaptation between the electronic components and the coil sensors are then discussed for different geophysical specifications.

Keywords: Earth conductivity imaging, TEM, EMI, EM system response, short, time transient.

*Speaker
Effects of the storm of January 7th, 2014 on the Atlantic coast of the Rabat region

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The Moroccan Atlantic coast has experienced on January 7th a terrible night caused by waves arising from a hazardous swell, linked to a major depression in the Azores. The wave coincided with the meso diurnal tide of 3 to 3.5 meters with meso-tidal range and its combination with the swell has caused overflows of waves oscillating between 6 and 7 meters reaching the road. In this work we propose to conduct a study of the effects of the storm on the Moroccan coast already greatly weakened, particularly sensitive and complex undergoes diverse and growing pressures (over-population, urbanization, industrialization, tourism, overexploitation of marine resources and climate change). The approach combines the findings in the field and grain size analysis of sediment of the study site. Indeed, the houses and the coast sheds were destroyed. In addition, the beaches were heavily eroded, and coastal flooding caused a loosening of blocks, a destabilization of riprap, transport, deposition of a classified sediment deposit and a lot of debris on the coast.

Keywords: Moroccan Atlantic Coast, Storm, storm surge, Submersion, Erosion, sediment.
Study of soil salinity in the Sed el Masjoune region (Central Bahira - Kalaa des Sraghna, Morocco)

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In Morocco, the surface area of saline soils rises to hundreds of thousands of hectares throughout the country, of which 10,000 hectares are in the Sed El Masjoune region. These saline soils are a hindrance to the growth or survival of most crops. Which limits agricultural development in this region. Within the framework of the management and the valorisation of these soils for a sustainable agricultural development and to arrive at strategies of their use, a qualitative study was carried out on the surrounding agricultural lands of the lake of Sed El Masjoune. This study allowed us to characterize the degradation and the salinity of the soils under the effect of the arid climate and the geomorphological and hydrogeological situation. The assessment of the current soil quality situation in this study area was carried to 48 points. The results show that these soils are affected by severe salinity and alkalinity problems; the salinity-alkalinity relationship of the soils studied shows that soil salinity accounts for 79% of the variability of alkalinity. It follows that the alkalinity of the soils studied can be explained mainly by the salinity of the soil. The current situation of salinity and soil fertility in the Sed el Mesjoune area is very worrying, requiring careful management of its water and soil resources for sustainable and environmentally friendly agriculture.

**Keywords:** Soil, Salinity, Alkalinity

*Speaker*
LATE HOLOCENE PALYNOLOGICAL RECORD AND LANDSCAPE CHANGE FROM THE PIRAQUÊ-AÇU AND PIRAQUÊ-MIRIM ESTUARINE SYSTEM, ESPÍRITO SANTO, BRAZIL

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Piraquê-Açu and Piraquê-Mirim estuarine system (SEPAPM) is located next to the Aracruz City (19 57' S and 40 9' W), Espírito Santo State, Brazil. Palynological analyses were conducted based on two sediment cores (PA20 and PM1). The main purpose of the present study was to recognize and interpret the vegetation dynamics in the region around the collection site in the last 2000 cal yrs BP. The sediment cores were subsampled at each 10 cm depth. The samples were submitted to standard palynological processes. The PA20 sediment core obtained the oldest age of 1758±68 cal yrs BP at a depth of approximately 105-cm. However, the PM1 sediment core obtained the oldest age of ≈2071±82 cal yrs BP at a depth of 95-cm. The comparative record of the sediment cores demonstrated that palynomorphs deposition were directly influenced by local water circulation. Pollen analysis indicated the striking presence of mangrove vegetation, which is mainly characterised by the Rhizophora pollen type. The other vegetation communities underwent little variation over the studied period. The top sediment layers of both sediment cores are characterized by the presence of exotic pollen grains of Eucalyptus, introduced by humans, and by the decrease of the original vegetation.

Keywords: Holocene, estuarine sediments, palynological analysis, vegetation, environmental evolution.

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Upper Cretaceous to early Eocene dinoflagellate cysts from the Fresco 2 borehole, southwestern Côte d’Ivoire: biostratigraphy, palaeoenvironmental and paleobiogeographical implications

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Upper Cretaceous to early Eocene sediments (cuttings) of the Fresco 2 borehole in southwestern Côte d’Ivoire, are here subject of lithostratigraphic and palynological studies (palynostratigraphy, palaeoenvironment, paleobiogeography). 8810 palynomorphes, of which 68 species of dinoflagellate cysts, 14 species of spores and pollen grains and a Chlorophyceae species were identified. The biostratigraphy, based on dinoflagellate cyst marker events and comparison with several reference sections in the Northern Hemisphere, allowed a detailed age determination to the stage level (Early Maastrichtian to Ypresian) of the studied deposits and identification of the famous Cretaceous–Paleogene and Paleocene–Eocene boundaries. The dinoflagellate cyst events used here include the Last appearance Datum (LAD) of Odontochitina operculata and Andalusiella ivoirensis for the Early Maastrichtian, LAD of Dinogymnium spp. and Cerodinium granulostriatum for the Late Maastrichtian, LAD of Cerodinium diebelii and Andalusiella spp. for the Late Danian, acme of Apectodinium spp. for the Paleocene–Eocene boundary and higher abundance of Adnatosphaeridium multispinosum, Fibrocysta lappacea and Pentadinium laticinctum for the Ypresian. Quantitative analyzes of the dinoflagellate cysts and other palynomorphs such as spores and pollen allowed reconstructions of the palaeoenvironment and paleobiogeography. The Cretaceous sediments in Fresco 2 were deposited in a marine environment of outer neritic type, in a transgressive and regressive regime in the Late Maastrichtian. The rest of the Paleogene is marked by several transgressive and regressive episodes with warming conditions at the end of the Paleocene. Following Lentin and Williams (1980), deposits of Fresco 2 are allocated to a tropical to subtropical province.

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Keywords: Cretaceous–Paleogene boundary, Paleocene, Eocene boundary, palynology, dinoflagellate cysts, Palaeoenvironments, Fresco, Ivory Coast.
Monitoring land cover changes and mapping areas at risk of land degradation using remote sensing and GIS techniques: A case study of Guelmim Region, Morocco

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1 remote sensig and GIS – Morocco
2 remote sensing and GIS – Morocco

The study area is located in the South of Morocco, in the Region of Guelmim. It is located according to the following geographical coordinates: 28 ° 97' N and 10 ° 06' W. Despite of the semi-arid climate, the region is exposed to the floods risk. In 2014, this sector was ravaged by inundation due to the intense rainfall which caused a lot of damages.

The main objective of this study is to detect changes in land cover and map areas vulnerable to the land degradation risks as a result of the floods that recently hit the Guelmim region South of the Morocco. The approach used is based on Multicriteria analysis using spectral index extracted from spatial data. The results obtained show that the approach is very useful to detect the visible changes on the surface and mapping areas at risk of land degradation.

Keywords: Land cover, Change detection, land degradation risks, Multicriteria analysis, Spectral index, Guelmim, Flood.

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Exceptional preservation of crustaceans from the Jurassic Konservat-Lagerstätte of La Voulte-sur-Rhône (Ardèche, France)

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The fossil record is incomplete and is far from delivering a full picture of past biodiversity. Some localities yield exceptionally preserved fossils – displaying non-mineralized tissues and organisms and beautiful morphological details. The causes of such an exquisite preservation remain poorly known, it is unclear whether those sites truly are "windows to the past". We hereby propose to investigate the question through the coupled study of anatomy and mineralogy of exceptionally preserved shrimps within carbonate-rich concretions from the Jurassic Konservat-Lagerstätte of La Voulte-sur-Rhône (Ardèche, France). Various microscopy and spectroscopy techniques (incl. synchrotron light source) were used to assess the geochemistry and mineralogy of the fossils, in relationship with their anatomy. After studying a dozen of specimens with SEM-EDX (IMPMC) and some sections with coupled XRF and XRD (synchrotron SOLEIL), we were able to revise and more accurately describe the mineralogical phases forming the fossils, whether they are preserved in 3D or flattened in comparison with the sedimentary matrix surrounding them. These results allowed us to propose a new taphonomical scenario for La Voulte crustaceans. A study of the organic matter held within the fossils, and of its syngenicity is planned to more fully understand the processes leading to exceptional preservation.

Keywords: Preservation, Taphonomy, Crustacean, La Voulte, Jurassic, Geochemistry

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Implication for the use of benthic foraminifera as bio-indicators of pollution: The case study of the Northern coast of Sfax (South eastern Tunisia)

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The use of foraminifers as bioindicators of pollution in coastal and paralic environments has undergone a very fast development. Among various criteria, morphological anomalies are sometimes considered as pollution indicators. This paper presents a synthesis of the studies correlating foraminiferal assemblages and environmental concerns. A 30 m-long coring system was used to retrieve 3 sedimentary cores from the Northern coast of Sfax (SC12, SC9 and SC6) are used to monitor the response of benthic foraminifera to modern pollution and environmental stress. Sediment samples were separated immediately after collection for benthic foraminifera analysis. Binocular microscope and the Scanning Electron Microscope (SEM) were carried out to identify the most significant, normal or deformed, specimens. All observations confirmed that foraminifera may be used as indicators of pollution after deconvoluting from natural impacts. The most sensitive foraminifera identified in the study area are Ammonia tepida, Ammonia beccarii, Elphidium crispum, Peneroplis pertususles Miliolidae, Peneroplis pertusus et Rosalina sp and Peneroplis planatus. The morphological study of benthic foraminifera from surface sediments attests for the pollution of the actual coast. This pollution is recorded in the benthic foraminifera tests mainly as shell deformations, chambers or streaks or abnormal colors.

Keywords: foraminifera, bioindicator, morphological anomaly, Sfax Tunisia, Holocene

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The potential of dinosaur footprints for palaeoenvironmental and palaeogeographical reconstitutions in Morocco

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Dinosaur footprints have been used for many years as an important indicator to study of their locomotion, physiology and behavior. Recently, the scientists became also interested in their living environment. However, only few published works have proved the main use of dinosaur footprints in paleoenvironment and sedimentary sequences. Herein, we demonstrate that the Moroccan Mesozoic sediments have shown an important number of dinosaur footprints, with more than 94 sites reported. While most studies are essentially dedicated to the ichnology aspect, the main goal of this work is to: (1) create a database of the distribution of more than 3300 footprints through all the Moroccan territory, (2) study the composition of footprints substratum, through the analysis of thin sections (3) explore the local and regional mechanisms and processes responsible for the substratum creation and footprints conservation in different environments, through the comparison of our thin section results with the stratigraphy and sedimentology reviews of each site. This new approach highlights the importance of Dinosaur footprints for palaeoenvironmental and palaeogeographical reconstructions.

Keywords: Dinosaur footprints, Morocco, palaeoenvironment, palaeogeography

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Megacrysts in Tephra of The Manzaz Volcanic District (Central Hoggar, Algerian Sahara)

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The Manzaz volcanic district is a part of the Hoggar Cenozoic volcanic province. The Neogene volcanic activity was mainly caused by reactivation of mega-shear zones crossing the Tuareg Shield, trending either North-South, inherited from Pan-African transcurrent faults, or SE-NW and SW-NE, formed during the Mesozoic. Tephra, ash and tuffs, deposited by air-fall spread around the volcanic edifices. They contain megacrysts that are mainly cm-size brown Ti-rich amphibole (magnesio-hastingsite) and mm to 1 cm-size olivine (Fo94), clinopyroxene (diopside), titanite and plagioclase (oligoclase). Analysed crystals were sampled in the western zone of the district around Ouukem maar and Menzez strombolian cone, and in the central zone at the foot of V1 strombolian cone. Mineral major-element compositions, measured by electron microprobe (EPMA), were used to estimate thermodynamic parameters existing at depth. The Al-in-amphibole geobarometer (Schmidt, 1992; Anderson & Smith, 1995) suggests one large, or several smaller reservoirs emplaced at a depth of 32 ± 2 km, which corresponds to the crust-mantle boundary under the district. The CpxBar geobarometer (Nimis & Ulmer, 1998) suggests, with a larger error of ± 6 km, additional reservoirs emplaced within the crust at a depth of 25 km in the west and only 10 km in the centre of the district. The Ti-in-amphibole geothermometer (Féménias et al., 2006) indicates values of 1100 to 1000 ± 15 °C. Calculated temperatures are consistent with deep mafic liquids, which amphibole megacrysts crystallized from.

**Keywords:** Hoggar, Manzaz, Cenozoic volcanism, Geobarometer, Geothermometer, Megacrysts, Amphibole, Clinopyroxene

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Lithological and biostratigraphic characterizations of Turonian, Coniacian and Santonian sediments in San Pedro eastern margin (Côte d’Ivoire).

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We present here the results of biostratigraphic (foraminifera, nannofossil and palynomorph) lithological and diagraphy analyzes (logs published with the Geographix Discovery software) of cuttings and carrots taken from San Pedro eastern margin. The lithological analysis reveals the presence of siliciclastic sediments with indurated clays generally gray to black, very fine to coarse sandstones evolving in places in pellets and / or conglomerates. The biostratigraphic study showed the presence of abundant agglutinated benthic foraminifera, nannofossils and palynomorphs which allowed to recognize the stages going from Turonian to Santonian.

Keywords: Lithological, biostratigraphic, foraminifera, nannofossil, palynomorph, Turonian, Coniacian, Santonian, siliciclastic, Côte d’Ivoire.

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GEOTECHNICAL CHARACTERIZATION OF THE LATERITES OF THE NKOLESSONG - NDING CORRIDOR (CAMEROON, CENTRAL AFRICA)

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Laterite is a very common natural material in intertropical Africa, and largely used for road construction in Cameroon. When all the technical specifications are gathered, we notice a good durability of the works. However, the use of laterites is generally limited to embankment, form and foundation layers of surfaced roads. Indeed, because of the CBR parameter, binding and determining in pavement structures design, it is rather rare to meet quarries answering the requested specifications for an implementation in base coats. So, to find a correlation between this parameter (CBR) and other physical/mechanical properties seemed to be an essential approach that could simplify the localization of such quarries. For this purpose, nearly 600 samples of lateritic grounds of the Nkolessong–Nding corridor, 89 km, (center Cameroon area) were identified. The soils, taken between 10 and 150 cm depth on about thirty quarries, have an average density of 2.1 T/m3 for an average optimal water content of 12.13%. The evolution of the physical/mechanical curves of parameters reveals a correlation of quasi-proportionality between the optimal water content, the plasticity index and the liquidity limit, all three interdependent. The exploitation of the CBR values allowed a distribution into four categories: low (40), current (40 = CBR < 50), specific (50 = CBR < 65) and exceptional (> 65). From this categorization, the analysis of the physical parameters revealed a specific weight of reference of 2T/m3, determining a poor or exceptional material according to whether its density is lower or higher than this reference.

Keywords: Laterite, roads, CBR, category, physical parameter

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GEOTECHNICAL CHARACTERISTICS OF THE LATERITE GRAVELS OF THE NKOLESSONG - NDING ROAD CORRIDOR (CAMEROON, CENTRAL AFRICA)

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Laterite gravel is the common soil mineral resource used for construction of road base and subbase layers in the Equatorial African area. However, the review of previous works indicates that laterite ore deposits with higher bearing capacity are uncommon. Our aim is to find a correlation between the California Bearing Ratio index (CBR), binding and determining in pavement structures design, and other physical/mechanical properties in order to facilitate the localization of such deposits. For this purpose, nearly 600 samples of lateritic grounds of the Nkolessong–Nding road corridor (89 km) were identified. The soils, collected between 10 and 150 cm depth at thirty sites, have an average density of 2.1 T/m³ for an average optimal water content of 12.13%. The evolution of the physical/mechanical curves of parameters reveals a correlation of quasi-proportionality between the optimal water content, the plasticity index and the liquidity limit, all three interdependent. The exploitation of the CBR values allowed a distribution into four categories: low (CBR < 40), current (40 ≤ CBR < 50), specific (50 ≤ CBR < 65) and exceptional (CBR > 65). From this categorization, the analysis of the physical parameters revealed a specific weight of reference of 2T/m³, determining a poor or exceptional material according to whether its density is lower or higher than this reference.

Keywords: Laterite gravels characteristics, California bearing ratio (CBR), pavement structure design.

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Geomechanical behaviour of a rock barricade and cemented paste backfill: laboratory experiments on a reduced-scale model

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The GéoRessources Laboratory (University of Lorraine, UMR7359, France) and ASGA (Association Scientifique pour la Géologie et ses Applications, France), in collaboration with the Research Institute on Mines and the Environment (RIME- University of Québec in Abitibi-Témiscamingue, Québec, Canada), have developed an innovative experimental set-up to allow us to reproduce a rock barricade within a drift leading into an exploitation chamber (called stope in the mine). For this study, we reproduced the mining-operations scheme at the LaRonde mine in Québec, Canada. Our 1:50 scale model is composed of a 90 x 90 mm (height by width), 600-mm-long gallery and a 90 x 200 mm (width by length) stope with a height of 1000 mm. The objective of the experimental programme was to measure the barricade-backfill and barricade-gallery interactions as well as the relative displacement of the barricade during emplacement of the backfill. The model is adaptable, and the dimensions of the barricade and the morphologies of the walls and gallery can all be modified. Our experimental campaign allowed us to test a number of different parameters that can influence the behaviour of a barricade/backfill complex: (i) the rate of backfilling and the water content of the backfill; (ii) the position, particle-size and dimensions of the barricade; and (iii) the shape of the barricade. The tests have provided us with a better understanding of the effects of the main parameters that influence on the behaviour of backfilled underground mines.

Keywords: Barricade, cemented paste backfill, reduced, scale model, laboratory tests

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Spatio-temporal analysis of the Rhone channel morphology from Geneva Lake to the Mediterranean Sea

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This study is about the French Rhone riverbed longitudinal organisation and its evolution over a century, with a view to improve the management strategy for the sediments. It first describes the geographic, geologic and hydrologic peculiarities of the 512-km long fluvial system. Gravel mining, dikes construction, channelization and dams construction have simplified the lateral pattern of the channel, incised and paved the riverbed and impoverished the aquatic and riparian habitats. The thesis then more precisely characterizes the riverbed dynamics. It relies on bathymetric data collected since 1897 and on grainsize data collected specifically for this study from over 300 samples on the whole 512-km river length. An homogeneous sampling protocol was elaborated on purpose. The vertical bed evolution and grainsize distribution were analysed to assess the riverbed potential mobility, tributaries’ sediment recharge and infrastructures’ impact on sediment transport. It thus appears that 1) riverbed incision is mainly due to channelization, 2) hydroelectric dams partitioned the continuum with the accumulation of fine sediments in some backwaters and the pavement of bypassed reaches downstream of Lyon and 3) a residual dynamic persists during major floods, with moderate gravels transport. The data of paved reaches were used in a 1D hydraulic model to quantify transport capacity and bedload discharge, confirming the aforementioned results. This study helps formulate such recommendations for sustainable river management and ecological restoration as opening slush gates during floods, changing dams management instructions or reinjecting gravel.

Keywords: Rhone River, long profile, bedforms, grainsize distribution, homogeneous sampling protocol, transport capacity, gravel mining, dams, Girardon groynes system, ecological restoration

*Speaker
Interferometric synthetic aperture radar (InSAR), more specifically calculation of coherence images, can be used to infer changes in the ground surface’s geometry. If these changes come from the emplacement of a lava flow, coherence images can then be used to map the flow. For this purpose, we developed an algorithm which separates the lava flow pixels from the others depending on their median shade. After processing the picture, we get a map and a surface for a given date. By doing this for several dates, we thus can follow the time and space evolution of the lava flow. For the August – October 2015 eruption of Piton de la Fournaise, available InSAR data allowed us to map the lava flow at nine different dates between 08/29/15 and 11/01/15. We estimated the flow’s surface for each date; at the end of the eruption, the total surface estimation is 4,251 106 ± 4.5 104 m2. This work could be pursued to map active parts of the flow and to estimate the volume of emitted products.

**Keywords:** Piton de la Fournaise, volcanology, radar interferometry, InSAR, lava flow
Environmental conditions for the formation of silica-witherite biomorphs and relevance for microfossil identification in Archean cherts

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Hydrothermal environments were common in the Archean and formed a likely site for the origin and early evolution of life. Carbonaceous microstructures found in ancient hydrothermal cherts are difficult to interpret as remnants of early life, however, because abiotic artifacts in these rocks cannot easily be excluded.

Hydrothermal fluid-induced serpentinization of ultramafic crust can generate alkaline, silica-saturated fluids. It was shown that under these conditions complex carbonate-silica crystalline aggregates can self-assemble that display a myriad of life-like morphologies (so-called biomorphs). Such biomorphs may subsequently adsorb organics (hydrocarbons are formed by Fischer-Trosch type synthesis in these environments). Clearly, hydrothermal environments are complex systems where both living and non-living entities could have been present.

In order to distinguish traces of life from abiotic artifacts, it is critical to describe precisely the diversity of microstructures that can arise abiogenically in these environments. In order to shed light on the environmental conditions of biomorph formation, we conducted witherite-silica biomorph synthesis experiments for a range of different pH values and BaCl2 concentrations, and we followed the evolution of the system with time. The biomorphs were observed with conventional Optical Microscopy and Scanning Electron Microscopy.

These results show that various life-like structures (from fractal dendrites to frambooidal aggregates and complex structures with continuous curvature) can form under a wide range of conditions. The distribution of morphological shapes depends on the characteristics of the fluids involved (cation composition, pH, dissolved CO2 content). The relevance of these morphologies for microfossil identification in Archean cherts will be discussed.

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Keywords: Biomorphs — Early Life — Micropaleontology —
Groundwater resources in Morocco are increasingly scarce. The study area, which is Central Haouz belonging to the Marrakesh plain, is not immune to this phenomenon. This is due to the semi-arid climate on the one hand, and on the other hand, due to accelerated population growth and the economic development implications. The Plio-Quaternary aquifer of the Central Haouz has been the subject of several studies, but its Hydrogeological characterization has been classically carried out using geological and pumping test studies.

Our study is in this sense to show the importance of the contribution of GIS and Magnetic Resonance Sounding (MRS). The first GIS approach determined the runoff coefficient, which help to locate low runoff areas corresponding to recharge zones of the water table. These areas are chosen as site for geophysical surveys.

The second method consists of the direct quantification of groundwater and the determination of hydrogeological parameters. Three MRS surveys were performed that showed the presence of two aquifers:

- The first aquifer showed water content up to 11% over a depth of 25 meters with a high porosity, this is confirmed by the static level of a well in the area.
- The second aquifer showed water content of 30% over a depth of 70 meters.

Consequently, the second aquifer present greater water quantity what allows to locate exploitable part corresponding to the second aquifer by exceeding 70 meters depth. This zone consists essentially of open water can be contained in fault depending on the area geology (encrusted limestone, sandstone).
Keywords: MRS survey, GIS, water content, hydrogeological characterization, Central Haouz
Physicochemical and Microbial contamination of soil under controlled application of domestic wastewater

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This research was initiated in view to the increasing danger of soil and groundwater contamination with pollutants and pathogenic bacteria due to wastewater land application. The aim of this study is to evaluate the effects of untreated and treated wastewater in comparison with well water, on the soil. The experiment was conducted in a wastewater treatment plant in Tidili, Morocco. The municipal wastewater is treated with constructed wetland system, where a land area of 75 m² was arranged to install three plots. Equal amount of well water (the control), untreated and treated wastewater was applied using surface irrigation method. The sampling was done once a week over a nine-month from March to September 2016. The irrigation water sources were also sampled for analysis. Both soil and irrigation water samples were analyzed for different physicochemical (pH, soil moisture, soil texture), biological parameters (Total coliforms (TC), Fecal coliforms (FC), and helminth eggs) using standard methods. The results indicated that The soil texture consisted of 82% sand, 15% clay and 3% silt, classified as sandy loam, according to the USDA classification . The value for pH was 8.2 for well water, 8.11 for treated wastewater and 7.78 for raw wastewater within the basic rang. The plots irrigated by raw wastewater seem to be more contaminated than the others with FC, TC and FS, respectively, reaching 4; 4.5 and 3.5 log U per 100 g of soil humid weight. Both soils watered with well water and treated wastewater presented a no contamination in helminth eggs.

Keywords: Soil, Wastewater, Contamination, surface irrigation

*Speaker
Sunda shelf (SE Asia) subsidence inferred from coral reef morphology modelling

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Lithospheric vertical deformations have been responsible for major modifications of the SE Asia geography in the last 5 My. West and Southeast continental shelves seems to be dominated by subsidence, whereas myriad of islands emerged elsewhere. Such pattern of vertical ground-motions is reflected by the striking bimodal repartition of coastal geomorphologic features: uplifted reefal terraces, notches and cliffs are ubiquitous in central SE Asia and attest for a general uplift. Conversely emerged paleo-reefs are absent on Sunda and Sahul shelves and wide alluvial plains dominate coastal areas, although modern reefs are well developed over those platforms. Recent modelling predictions moreover suggest permanent post-Eocene dynamic subsidence of the Sunda shelf related to the activation of the Sumatra-Java subduction. Estimated rates are rare, except at the platform margin and in sedimentary basins.

In order to quantify the vertical rates, we used a probabilistic approach based on a model that reproduces coral reef morphology development trough time in response to sea level variations. The model takes into account growth reef rate, Quaternary sea level variations, sub-marine erosion and subsequent sedimentation. We match the reef morphology of the representative Belitung island (Sunda shelf), to extract the subsidence rates of the area. We find that the mean short-term subsidence rates range from -0.20 to -0.45 mm/yr. Considering low shelf bathymetry (up to 120 m), such subsidence rates suggest that Sunda shelf would have been permanently emerged until recently, even during periods of high SL, with probable first order impacts on the biogeographic and climatic evolution.

Keywords: Subsidence, Sunda shelf, Coral, Modelling, SE Asia
Building a new Taphonomic Model for Brazilian Mesosaurs Based on a Quantitative Perspective

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Given their abundance and wide distribution, mesosaurs have been extensively studied from different perspectives. Taxonomically robust, comprising three well-established genera, as well as stratigraphically significant, this taxon plays a major role in the correlation between marine paleofaunas of African and South American Lower Permian coeval strata. From a taphonomic point of view, however, little research effort has been spent on these reptiles. Despite the hundreds of partial or complete skeletons held in collections, the only current model for Brazilian mesosaur taphonomy is problematic because of internal inconsistencies. The model posits that these organisms underwent instant burial after death, followed by successive storms that would have reworked previously deposited carcasses, generating different degrees of skeletal disarticulation. Here I present a preliminary analysis showing an opposite taphonomic hypothesis involving a long floating phase before residence at the water-sediment interface as well as a more defined disarticulation phase rather than randomly scattered disarticulation events. The Beardmore method employed here is based on a quantitative correlation between degrees of articulation and completeness in nine different parts of the skeleton, providing a basis for understanding trends in carcass disarticulation. In a broader sense, this methods is a good tool for elucidating some aspects of fossil deposition, such as transport in the water column, average time before burial or even disarticulation within the sediment. Additionally, the new approach to Brazilian mesosaur fossil assemblages might improve our understanding of the depositional environment of the African portion of the Whitehill-Irati Sea.

Keywords: Taphonomy, Mesosauridae, Brazil, Irati, Beardmore method

∗Speaker
Formation of dinosaur tracks in a surprisingly coarse substrate.

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Dinosaur tracks are common in continental sediments dated from the Triassic to the end of the Cretaceous. They are found in a variety of palaeoenvironments, ranging from mixed carbonated or siliclastic tidal flats to floodplains. However they are mostly found in fine-grained sediments. This work focuses on an Upper Triassic outcrop in Ardèche (southeastern France) in which nearly 200 archosauromorph tracks were found in coarse-grained sandstones. They contain large (> 1 cm) detrital grains, some of which are associated with the tracks. The aim of our study is to determine how these tracks have been formed in such coarse sediment.

The track-bearing level is at the top of a high-energy, stacked, migrating fluvial system that deposited channelized coarse sandstone beds. This bed is overlain by a continuous, 50cm thick layer of green clay likely deposited in a floodplain.

Taphonomic observations provide evidence that these tracks are in fact undertracks, formed when the animals walked on the clay during an aerial exposure episode. Aerial exposure is documented by mudcracks and mudchips found on the track-bearing surface. The trackmarkers deformed through the clay this layer of coarse sandstones, which recorded undertracks. The foot pressure induced the formation of a clayey coating of the undertracks and injected material of the overlying layer onto the top of the sandstones.

Overall, despite the coarseness of the track-bearing surface visible today, we argue that the tracks were formed in a low-energy environment in which the clay layer was a key preservational factor.

Keywords: Ichnology, Dinosaur tracks, Taphonomy, Undertracks, Sandstones

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Fossilisation potential of fungi in Baltic amber

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Fossil material is very important for better understanding of phylogenetic relationships and evolution of any organisms. Unfortunately fungi, due to their low preservation potential are rare in the fossil record. Fossil resin, amber, is a very good source of knowledge about ancient biota, including mycocoenosis, because resin can preserve highly detailed external morphology of entrapped organisms. Hitherto, few species of fossil fungi were found and described from Baltic amber, dated for Eocene epoch, including two related with insects.

To examine preservation potential of fungi in Baltic amber I studied with light-microscopy inclusions shared by several Polish museums, Zoological Museum in Copenhagen and private collection in Hamburg.

During investigation I found filamentous fungal forms on plant remnants and dead arthropods, mostly representing saprotrophic anamorphic stages. Plant related fungi fossils are dominated by Trichocomaceae, however single well preserved hyphae with conidia represent structure similar to the recent genus Periconia. On insects inclusions I mostly found saprotrophic stages of entomopathogenic Hypocreales and Entomophthorales fungi on Diptera (families: Dolichopodidae, Mycetophilidae), Coleoptera (Carabidae) and ants (Formicidae).

Based on my results I can conclude that although hypha melanisation increase preservation potential of fungi, some delicate, weakly melanisated structures can also fossilize. Interestingly, among entomopathogenic fungi, I found only saprotrophic stages, lacking any fossils of parasitic forms, what indicates that preserved infections developed after entrapment of the host insect in the resin either after its death or as a result of decreased immunity.

Keywords: Baltic amber, fossil fungi, taphonomy, preservation potential

*Speaker
Impact of submarine groundwater discharge on nutrient cycles in two Hawaiian bays

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Hawaiian coastal waters suffer from excess nutrient load, that affect the coral growth by enhancing macroalgae proliferation. The major vector of nutrients into the Hawaiian bays is submarine groundwater discharge (SGD), which has two components: fresh terrestrial groundwater coming from the upland and tidally pumped seawater recirculating into the beach sediment. This study quantifies the role of these components of SGD into the nearshore zone of two reefs on the island of Oahu: Maunalua Bay and Kāneohe Bay. The less understood recirculating seawater component receives a particular attention.

A two-step approach is implemented: first, groundwater circulation through the beach berm is characterized based on apparent ages; second, nutrient fluxes associated with the circulation are quantified by coupling nutrient concentration measurements and discharge estimates. 222Rn, 224Ra and excess silica are used to derive apparent ages of the recirculating seawater.

The trends in apparent ages observed in Maunalua match previously published groundwater circulation models: both fresh and saline groundwater discharges are present and a classical seawater recirculation loop takes place. In contrast, the ages obtained in Kāneohe seem to reveal a different way of tidal pumping with an absence of freshwater discharge and a reverse seawater recirculation loop. Derived nutrient fluxes show that the autochthonous production of inorganic nitrogen and phosphorus occurring during the seawater recirculation process has a significant impact on nutrient cycles within the nearshore areas of the bays. This result suggests that seawater recirculation should be taken into account in biogeochemical studies of coastal areas.

Keywords: submarine groundwater discharge, radon, nutrient cycle, reef

*Speaker
Morphologic characteristics of Rifain neotectonic deducting by morphometric analysis of drainages’ networks and watersheds

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To further understand the strong role played by neotectonics in recent evolution of Moroccan Rif chain, we realized a morphometric and morphostructural analysis using geographic information system (GIS). We based on several morphometric indices to determine the different morphologic characterizations that associate with a tectonic activity of the Rif. The results allowed us to reconstruct a regional calendar of the area studied.

In this chain, the analysis of drainages networks and its’ watersheds highlight two sectors tectonically unsteadied : (1) the first, localized in the northwestern of the Rif chain, is much nearer to Tetouan, Oued Lao and Jebha accidents; and (2) the second, localized in the eastern, is relied with the Nekor faults’ systems.

The geomorphologic indices (channel steepness index, hypsometric index, surface index ...) show definitively the cause-effect relationship between tectonic and landscape. It led us to identify a sectors showing the tectonic activity response (Whipple et Tucker, 1999; Wobus et al., 2006) in the Rif chain belt. In the fact, this study is an attempt to interpret morphologic indices of the Rif’s landscape, in spite of the difficulty to detect a morphometric and morphostructural markers of tectonic activity through the presence of geological complexity, significant lithological contrast and important erosion processes.

**Keywords:** neotectonics, Rif chain, morphometric analysis, morphostructural analysis, geomorphologic indices, GIS, Rif’s landscape.

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*Speaker*
Multiple sulfur isotopes from Paleoarchean barite deposits: implications for the evolution of the early Earth atmosphere.

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It is generally considered that the Archean period was dominated by reducing conditions, with low oceanic sulfate concentration (< 10 mM). It is puzzling, therefore, that several barite (BaSO4) deposits were formed between 3.5 and 3.2 Ga in Western Australia, India and South Africa. How sulfate appeared in the oceans during the early Archean when oxidative weathering was absent remains unresolved. Does it reflect a period of unique conditions for the preservation of sulfate, an exceptional period of intense sulfate aerosol production, or an unexpectedly active biological sulfur cycle?

In the present work, we performed SIMS analyses of the four sulfur isotopes in the 3.2 and 3.5 Ga-old sulfate deposits from Mapepe (South Africa) and Dresser (Australia) Formations. This in situ approach allows us to investigate the isotopic heterogeneity of Archean sulfate with unprecedented resolution. Our results revealed that the barite might represent primary volcanic emissions formed by SO2 photochemical processes with variable contribution of OCS shielding in an evolving volcanic plume. Besides a volcanic photochemical reaction specific to the Archean, our findings identify the persistence throughout Earth history of photochemical reactions characteristic of the present-day stratosphere.

S-isotopic composition of the Archean barites and associated sulfides is in striking contrast with the record of sulfides in deeper water sedimentary and magmatic successions underlying the barite deposits. This discrepancy could reflect either different photochemical reactions caused by changes in atmospheric conditions (perhaps related to volcanic activity), or different conditions of transfer and preservation of the sulfur compounds through the water column.

Keywords: Archean, in situ, sulfate

*Speaker
Evolutionary Ecology
Evolution of one-sided mating behaviour precedes evolution of asymmetric genitalia in the Drosophila nannoptera species group

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Left-Right asymmetry is observed in many animal species, and has evolved independently multiple times. In insects, evolution of genital asymmetries has been proposed to be associated with changes in mating posture but experimental evidence is scarce. The Drosophila nannoptera species group encompasses four described species, including three that have asymmetric genitalia: Drosophila acanthoptera (asymmetric aedeagus), Drosophila wassermani (asymmetric anal plates), Drosophila pachea (asymmetric genital lobes) and Drosophila nannoptera, which has fully symmetric genitalia. Previously we reported that D. pachea males adopt an asymmetric mating position on the female’s right side. To examine whether mating behavior might have evolved after or before evolution of asymmetric morphology, we analyze copulation in 3 nannoptera species and in 7 related Drosophila species by video recording. Comparing across species, we found three specific changes on the mating behavior of the nannoptera group: i. copulation duration is increased, ii. male bends dorsally over the female iii. the male position is deviated away from the female midline axis. Interestingly, Drosophila nannoptera males, which displays symmetric genitalia, usually mate right-sided. Strikingly, males of Drosophila machalilla (the closest related symmetric species), mate either right-sided or centrally. All together our data corroborates the hypothesis that the evolution of one-sided mating behaviour in the nannoptera species group has preceded the evolution of asymmetric genitalia.

Keywords: Asymmetry, Drosophila, genitalia, nannoptera.

*Speaker
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Genital bristles required for the male to position himself along the female axis during copulation

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Mating behavior is extremely stereotyped. In most Diptera the male and female body axes are aligned on top of each other, during copulation. How this perfectly symmetrical mating position is achieved is unknown. The hypandrial bristles are a pair of long stout sensilla (left and right) located in the internal structure of the male genitalia of several species of Drosophila. To test whether hypandrial bristles play a role during copulation two experiments were carried out. First, we removed by laser ablation left, right, or both (left and right) hypandrial bristles in D. melanogaster. Males were then placed with virgin females and their copulation was recorded. We found that males with a single bristle took significantly more time than males with two bristles to settle into a stable position on top of the female. Furthermore, one-bristle males tilted towards the contra-lateral side, relative to the ablated bristle. Second, we examined copulation of males originating from a stock of D. melanogaster flies with 0, 1 and 2 hypandrial bristles, using a scute mutant rescued by transgenic constructs containing part of the scute gene. Our results show that hypandrial bristles are mechanoreceptors implied in the formation of a perfectly symmetric male-female complex during copulation.

Keywords: Drosophila, copulation, hypandrial bristles, laser ablation, mating, transgenics
Ménage à trois - Parasitic fungus closes gap between two trophic levels

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Eutrophication processes in lakes become more frequent and severe, increasingly promoting cyanobacterial blooms. Zooplankton grazers often fail to exert an effective top-down control of cyanobacteria due to their inedible cell sizes, low nutritional value and the production of toxic compounds. Therefore, cyanobacteria are considered as trophic bottlenecks, decoupling primary and secondary production. However, field observations often report high biomasses of grazers during blooms, suggesting alternative sources of nutrition. One component that is usually overlooked in trophic interactions is parasitism. Only recently, the role of chytrids, parasitic fungi characterised by free swimming zoosporic stages that lethally infect their hosts, was acknowledged in aquatic food webs. In our study, we addressed the interface between predator-prey and host-parasite interactions by conducting a life-table experiment, in which we exposed the zooplankter *Daphnia* to diets consisting of either healthy cyanobacteria or chytrid-infected cyanobacteria, and additional treatments of purified chytrid zoospores and heterotrophic bacteria suspensions. *Daphnia* performed either better or equal on parasitised cyanobacteria than in the absence of infection. Results show that the improved fitness of *Daphnia* is attributed to three causes: (i) *Daphnia* feed on chytrid zoospores which, due to their higher nutritional quality, trophically upgrade cyanobacterial carbon, (ii) increased heterotrophic bacterial biomass, promoted by cyanobacterial decay, provides an additional food source for zooplankton, and (iii) infection-induced fragmentation of cyanobacterial filaments renders cyanobacteria more edible. Our results demonstrate that chytrid parasitism can sustain zooplankton under cyanobacterial bloom conditions, and exemplify the potential of parasites to alter interactions between trophic levels.

**Keywords:** lake eutrophication, food web interactions, host, parasite interactions, trophic levels, zooplankton, chytrids

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Insights from the shell proteome: biomineralization to adaptation

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Bivalves have evolved a range of complex shell forming mechanisms that are reflected by their incredible diversity in shell mineralogy and microstructures. A suite of proteins exported to the shell matrix space plays a significant role in controlling these features, in addition to underpinning some of the physical properties of the shell itself. Although, there is a general consensus that a minimum basic protein tool kit is required for shell construction, to date, this remains undefined. In this study the shell matrix proteins (SMPs) of four highly divergent bivalves (The Pacific oyster, Crassostrea gigas; the blue mussel, Mytilus edulis; the clam, Mya truncata and the king scallop, Pecten maximus) were analyzed in an identical fashion using proteomics pipeline. This enabled us to identify the critical elements of a “basic tool kit” for calcification processes, which were conserved across the taxa irrespective of the shell morphology and arrangement of the crystal surfaces. In addition, protein domains controlling the crystal layers specific to aragonite and calcite were also identified. Intriguingly, a significant number of the identified SMPs contained domains related to immune functions. These were often are unique to each species implying their involvement not only in immunity, but also environmental adaptation. This suggests that the SMPs are selectively exported in a complex mix to endow the shell with both mechanical protection and biochemical defense.

Keywords: Biomineralization, shell matrix proteins, basic shell forming tool kit, adaptation, bio-

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chemical defense
From local processes to macroevolutionary patterns: the example of mutualistic mimicry

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Phylogenies reflect past evolutionary histories of species. Identifying the drivers of diversification is therefore needed to understand the variations in shape and size of phylogenies. In addition to abiotic factors, ecological interactions have been recognized to explain such variations. However, unlike antagonistic interactions, the effects of mutualistic interactions on diversification processes are not well understood yet.

Using a spatially-explicit population-based model, we aimed at deciphering large-scale patterns of diversification mediated by mutualistic interactions. We focused on mutualistic Müllerian mimicry between conspicuous toxic prey species, where convergence in colour patterns emerges from predators’ learning process. To investigate the effects of Müllerian mimicry on species diversification and on the resulting phylogenies, we assumed that some speciation events stemmed from shifts in ecological niches, and could also be associated with shift in mimetic colour pattern. Through the emergence of spatial mosaics of mimetic colour patterns, Müllerian mimicry constrained the geographical distribution of species and allowed different species with similar ecological niches to exist simultaneously in different regions. Müllerian mimicry and the resulting spatial segregation of mimetic colour patterns thus generated more balanced phylogenetic trees and increased overall species diversity. Our results shed light on complex effects of Müllerian mimicry on ecological, spatial and phylogenetic diversification.

Keywords: Phylogenetic trees, range size, macroevolutionary patterns, mutualism, Müllerian mimicry, agent, based model

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Born in the USA: a quantitative genetic study of the invasive tree Robinia pseudoacacia in Europe.

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Biological invasions are recognized as a major threat for native plant communities and ecosystems. Most of the biological invasion studies have been concentrating on ecological research, and the role of evolution was often overlooked. Indeed, adaptive evolution is often thought as a slow process. Nevertheless several studies documented fast evolutionary events leading to local adaptation in the invasive populations. 

Robinia pseudoacacia (L.) was introduced to Europe from the USA at the beginning of the 17th century and is now considered one of the worst invasive species in Europe. In order to evaluate the mechanisms behind its invasiveness, both quantitative and population genetics studies are underway. Early development phenotypic traits were evaluated in European populations. A controlled experiment was set up using 2000 seeds from 10 populations in Southern France and 10 populations in Belgium. Seedlings were cultivated in two climatic chambers set at 18°C and 22°C. Both morphometric and life history traits were monitored. Families exhibited a strong plasticity to temperature for all measured traits, the warmer environment being generally more suitable whatever their population of origin. No significant departure from neutral evolution was evidenced using a QST - FST comparison, however we showed that QST was lower than FST for all traits. Additionally, using structure analysis, large amount of admixture was detected among introduced populations although some differentiated populations can be detected, raising new hypotheses about genetic and evolutionary processes occurring during black locust invasion.

Keywords: biological invasion, Robinia pseudoacacia, local adaptation, phenotypic plasticity, QST, FST comparison, quantitative genetic, population genetics

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Colour competition in hummingbirds communities

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Colours in many animals result from the evolutionary interplay between natural selection (crypsis) and sexual selection (communication). Since colours are used in species recognition, co-occurring species should diverge in their colour signals, thus reducing sensory competition. The question of colour competition is largely overlooked, especially at large taxonomic level. Here, we tested this hypothesis at interspecific level using hummingbirds (Trochilidae) as a model group. This family presents iridescent colours (changing in hue with illumination or viewing angle) which are rarely-studied colours. We had data on local species assemblages for 113 species and 189 communities in Ecuador. We measured male plumage coloration of these species using goniospectrometry on museum specimens from Paris and Lyon collections. Using comparative analyses to take into account species relatedness, we found a high phylogenetic clustering of local communities, caused by a strong niche conservatism and a limited ability to disperse. But in spite of this phylogenetic clustering, we found no phenotypic clustering on colour traits, suggesting the existence of colour competition between sympatric species. This study is to our knowledge the first one to integrate accurate measures of iridescence to community ecology and may be the beginning to more studies on the evolution of complex visual signals and their interaction with ecological processes.

Keywords: hummingbirds, colour, competition, community, comparative analyses

*Speaker
Landscape influences the morphology of male common toads (Bufo bufo)

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In Europe, the recent agricultural intensification has strongly homogenised the landscape. This loss in habitat diversity and the use of agrochemicals are considered as major causes of the global erosion of biodiversity. Landscape changes may also favour phenotypic variation with divergences between populations even at a small spatial scale. We investigated this notion in the common toad (Bufo bufo), a species that inhabits a wide variety of rural habitats. Specifically, we compared the morphology of male adult toads from three contrasting landscapes: forests, traditional farming landscape (bocage) and intensive farmlands. Overall, individuals from open landscapes were larger and heavier, had longer hind legs and larger parotoid glands than their forest counterparts; suggesting that open landscapes positively influence body size in this species. However, toads from intensive farmland were less symmetrical, suggesting that these individuals may have experienced environmental stress during larval and/or post-metamorphic development. Overall, our results suggest that landscape-specific traits can influence the morphology of male toads in complex ways. Further studies are required to comprehensively assess the impacts of environmental and anthropogenic pressures on amphibians in agroecosystems.

Keywords: agroecosystems, amphibians, landscape homogenisation, morphology, fluctuating asymmetry

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Nest predators and predation effect factors of Red-whiskered Bulbul

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As a common and seed dispersal agent in anthropogenic open habitats in tropical Asia, the breeding ecology of Red-whiskered Bulbul (Pycnonotus jocosus) is rarely studied, although the nest predation is a main pressure on success of reproduction. We spent 4 years investigated nest predators, the effects of parental visits and nest site on the nest predation of P. jocosus by recruited digital video and infrared cameras. Based on our results, eleven predator species have been recorded in total, and seven of them were diurnal. Great coucal and tree shrew species were the main predators. Furthermore, nest predation rate positively correlated with parental visits frequency, but it was not heavily affected by nest site. These results imply that multi-predators, high ratio of diurnal predators and effect of parental nest visit together leads to a relatively small clutch size (2 - 3 eggs) and a variety of plant species were used as nest building sites. We concluded that nest predation play a key role in the evolutionary process of breeding strategies in P. jocosus.

Keywords: Red whiskered bulbul, nest predation, effect factor

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Sex or food, what matters the most in the intimate relationship between Wolbachia and the parthenogenetic termite Cavitermes tuberosus?

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The termite Cavitermes tuberosus conditionally uses sexual and asexual reproduction to benefit from both strategies: workers, soldiers and dispersing reproductives are produced via normal sexual reproduction, whereas non-dispersing queens are produced asexually through gamete duplication. Thelytokous parthenogenesis can be encoded in the genome of C. tuberosus, or induced by maternally inherited bacteria such as Wolbachia, Cardinium or Rickettsia. By manipulating the reproduction of their hosts, reproductive parasites enhance their own transmission. We aimed at determining the presence and the potential impacts of reproductive parasites in C. tuberosus.

We collected 15 nests in French Guiana. All the nests screened were positive for Wolbachia infection based on 16S rRNA PCR. Conversely, nests were not infected by Rickettsia or Cardinium. Almost all individuals within a nest, whatever the caste they belonged, were infected.

Wolbachia strain was determined by sequencing six genes (16S rRNA and the five genes of the standard MLST protocol for strain determination in Wolbachia). Phylogenetic analysis unambiguously evidenced that one single strain, belonging to supergroup F, infected all nests. Sequences shared 99% identity with the Wolbachia strain from the bedbug Cimex lectularius. This Wolbachia haplotype is known to be essential for the host’s growth and survival. Overall, our results suggest an intimate symbiosis between Wolbachia and C. tuberosus, but its true nature, i.e. sex and reproductive manipulation or nutritional mutualism, remains unknown. Whole genome sequencing of Wolbachia will help to determine how the bacteria and the termite interact.

Keywords: Wolbachia, Termite, Parthenogenesis, Nutritional mutualism

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Effects of abiotic environment on the impact of a manipulative parasite on its host

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Many parasites are known to manipulate the behaviour of their intermediate hosts, supposedly in a way to increase their probability of transmission to their definitive host. This manipulation has been shown to vary in intensity at the intra-specific level. Considering the important effect of trophically-transmitted parasites on the modulation of trophic chains, understanding the variations of manipulation intensity and other infection parameters could lead to a better understanding of the dynamic of an ecosystem as a whole.

I tested the effects of two abiotic parameters, temperature and quality of food, on the success of infestation and the intensity of parasite manipulation. I conducted experimental infestations using the acanthocephalan *Pomphorhynchus leavis* and its intermediate host, the amphipod *Gammarus pulex*. We followed the development of parasites and the survival of hosts, and conducted metabolism and behaviour measures on infected and control hosts.

Despite a positive effect on hosts survival and parasites development, food level did not affect the intensity of manipulation. In addition, temperature was a strong determinant parameter for the speed of development of parasites. Those results suggest that variations in abiotic environment could have several effects on host-parasite interactions, leading to modifications at the scale of the ecosystem.

**Keywords:** manipulative parasites, gammarids, environment, acanthocephalan, parasitism, host

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*Speaker*
Machiavellian by nature: how cuckoo bumble bees deceive and manipulate their victims

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Cuckoo bumblebees lost the ability to make their own nest. They instead sneak inside the nest of other bumblebee species, replace the queen and exploit host workers to rear their offspring. This study shows that they are able to deceive host workers by mimicking their odor profile and to control them using aggressive behaviors.

Keywords: Social parasitism, social insects, bumble bees, mimicry, cuticular hydrocarbons

*Speaker
Comparison of the foraging strategies between juveniles and adults of a tropical seabird: the red-footed booby

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Foraging performances are poorly known in juvenile animals. In tropical waters, marine predators may use particular foraging strategies to minimize costs associated with low productivity and dispersed resources. Here we compare the foraging behaviour of juveniles and adults of a pan-tropical seabird: the red-footed booby. GPS loggers were fitted on birds breeding on Europa Island (Mozambique Channel) and the EMbC algorithm (Garriga et al. 2015) was used to determine the different behaviours adopted along tracks. We found that just after fledging, juveniles made a majority of intern flights on the island, probably to learn how to fly properly. During their first flights at-sea, they left the colony in groups of several individuals. Over time, they were observed leaving the colony more often alone. Juveniles came back to the colony earlier than adults because they needed to arrive before their parents to be fed. The duration and maximum range from the colony of juveniles was slightly increasing over time while remaining significantly lower than adult’s values. Juveniles were more often intensively foraging and less often travelling than the adults. Frequency, duration and size of areas where birds are intensively foraging, called area-restricted search (ARS), were also different. To conclude, we observed a slightly increase in the foraging skills of the juveniles along the tracking period (∼ 1 month) but they were still far from reaching the foraging skills of the adults.

Keywords: seabird, tropical, juvenile, foraging, red footed booby, EMbC

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Environmental changes and variations in dietary habits of Plio-Pleistocene Theropithecus (Primates: Cercopithecidae) from Omo Valley: contributions of Dental Microwear Textural Analysis

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The Shungura Formation, a geological unit situated within the lower Omo Valley in Ethiopia, has delivered major Plio-Pleistocene paleontological and archeological content, including numerous hominin and lithic remains. The spatial extension and chronological continuity of its sedimentary outcrops, notably between 3 and 2 Ma, has allowed to shed light on this critical period in hominin evolutionary history, marked by the transition from the genus Australopithecus to Homo and by the emergence of robust australopithecines.

Dental Microwear Textural Analysis (DMTA), an objective method to study microscopic texture of enamel occlusal facets produced during mastication of food items with various mechanical properties, has been proved to be effective in distinguishing among Primates with different diets. This analysis is performed on fossil specimens belonging to the most represented cercopithecid genus recovered in this geological formation: Theropithecus. Specimens included in the present study come from geological members B to lower G, covering a time window ranging from 3.44 to 2 Ma. Fluctuations of textural parameters between the geological members highlight variations in the intake of tough herbaceous monocots and softer herbaceous dicots.

In order to infer accurately the vegetation changes that took place in the paleolandscape of the ancestral Omo River, we linked these data with stable carbon and oxygen isotopic ratio already obtained from mammals enamel and paleosoils carbonates, along with palynological occurrences and faunal dynamics. Reconstructing the Plio-Pleistocene environment of the lower Omo Valley offers major insights into key events of hominins evolution that took place during this time span.

Keywords: Theropithecus, Omo Valley, DMTA, diet, Plio Pleistocene

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An Exploration of Interactions Between Pheromones and Coloration: Testing the Relative Importance of Cues in Heliconius Butterfly Mate Choice

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Developing a comprehensive understanding of the relative roles that functionally dissimilar traits play in the evolutionary ecology of Müllerian mimicry complexes is a central goal of the Heliconius butterfly research program. Wing coloration and pattern have long been implicated as key traits driving assortative mate choice within and between phenotypically distinct populations, races, and species of Heliconius. However, the relative importance that volatile pheromone chemistry plays in Heliconius mate choice has received considerably less attention. Given the ubiquitous nature of semiochemical communication in nature, and strong evidence of the importance of chemistry in mate choice from investigations of other lepidopteran taxa, the effect of pheromone chemistry in mate choice of Heliconius butterflies requires further investigation. I will discuss results from a series of behavioral assays designed to elucidate the relative importance of chemical and morphological traits in mate choice by female Heliconius. In choice tests, the ability of male Heliconius to emit volatile pheromones is highly correlated with the probability that a female will mate with them, while the presence of wing coloration has no effect on whether or not a male is mated. Additionally, choice tests in which wing coloration of males of two incipient species was obstructed, and pheromone producing androconial cells were left unmanipulated, females were more likely to mate with the male of her own species. Chemical profiles of males that had their ability to emit pheromones manipulated as well as that of incipient species are indeed distinct, as verified by gas chromatography – mass spectrophotometry.

**Keywords:** Heliconius, ecology, evolution, behavior, pheromone, assortative mate choice

*Speaker*
META-ANALYSIS OF EXCLUSION EXPERIMENTS OF DAY-NIGHT POLLINATORS. DO PLANTS RESPOND TO THEIR EXPECTED POLLINATION SYNDROME?

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The pollination syndromes are the set of morphological and physiological characteristics of flowers developed to attract specific pollinators. The theory of pollination syndromes has been discussed but there have been few formal quantitative evaluations with angiosperm plants. In this study, I present a proposal to carry out a meta-analysis of daytime-nocturnal pollination syndromes from those studies where day-night exclusion experiments were performed. In this way I checked quantitatively whether the most effective pollinators for different species can be deduced through the set of floral features presented.

Four measures of reproductive success (fruit set, seed set and number of seeds and / or fruits produced) were used to perform the meta-analysis. The objective was to verify if there were significant differences in reproductive success between the most expected time of the day depending on the plant syndrome (day or night exclusion in each case), the least expected (opposite to plant syndrome) and a control treatment (day and night pollination).

According to the results, significant differences of success were obtained for the number of seeds and / or fruits when the non-expected treatment was compared with the control treatment, observing a greater success when access was allowed to the complete spectrum of pollinators. In addition, it was found that when the expected pollinator is diurnal it is obtained more success in the control treatment than in the opposite treatment to the plant syndrome.

This indicates that many plant species, despite presenting specialised pollination syndromes, achieve similar success with complementary and generalist pollinators.

Keywords: pollination syndrome, diurnal pollinators, nocturnal pollinators

*Speaker
Influence of environmental and individual traits on dental microwear textures in a living population of mandrills (Mandrillus sphinx)

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Dental microwear analysis is frequently used in paleontology for diet reconstruction of extinct species. Contrary to fragmentary, isolated and rare fossil remains, populations of actual species for which the ecological context is known, constitute ideal models to understand the interplay between feeding ecology and its proxies. In particular, the study of living species, using in vivo dental molds, provides a useful overview of the feeding ecology, including environmental, physiological and behavioral data. In this study, we analyzed in vivo dental microwear textures collected in a natural population of mandrills (Mandrillus sphinx). Mandrills generally present a highly diversified diet with about 150 different plant species in the case of the studied population. Their feeding strategy is, however, conditioned by seasonal variations that constrain food availability, but also by individual’s age and sex. Accordingly, our analyses showed that these factors are, in turn, responsible for inter-individual variations in dental microwear textures. Indeed, seasonality, sex and age were all found to influence the microwear pattern. We further investigated the relationships between dental microwear textures and diet, characterized by food item diversity and by the physical properties of the food (texture and abrasiveness). We evidenced the impact of food choices on dental microwear and comforted therefore the usefulness of this proxy for individual ecology tracing.

Keywords: dental microwear, mandrill, feeding ecology, primate, teeth, gabon

*Speaker
Beyond the stripes of bees and wasps

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The infamous coloration of bees and wasps acts as an aposematic signal, warning potential predators, including us, that these insects are venomous. Such signal appears similar in these two groups: it is a contrasted pattern of black and yellow. However, common bees and wasps diverged more than 150 Million years ago. They are part of the aculeates, or stinging hymenoptera, which comprises 67 000 species displaying a tremendous diversity of shapes and colors. To this day, no study tested whether the aposematic signal of bees and wasps is a synapomorphy inherited from a common ancestor or an example of mullerian mimicry resulting from convergent evolution. Since mimicry acts at the scale of a community, under the influence of local predators, we study the coloration of all stinging hymenoptera from South Corsica. Our aim is to test to which extent aposematic colorations are diverse among these insects and whether these colorations result from synapomorphies or convergent evolution events.

**Keywords:** Mimicry, Coloration, Hymenoptera, Convergent evolution
Relative influence of cropping systems, injury profiles and institutional determinants on the spatio-temporal structure of bread wheat diversity in France

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In the current context of increasing climate instabilities and new pest pressures, in situ crop diversity has been recognized as a relevant way to avoid crop failure, ensure yield inter-annual stability while reducing the use of synthetic inputs. However, before implementing any future deployment of within-crop diversity, a detailed knowledge of the main drivers affecting this diversity appears necessary.

The temporal evolution of in situ genetic diversity of bread wheat has been previously shown to be spatially structured among regions in France over the period 1980-2006. Our study was carried out to identify the main drivers of this spatio-temporal structure of crop diversity at a fine spatio-temporal scale. We conducted a series of statistical analyses and expert surveys to identify the effects of three main categories of drivers: agricultural systems, pathogen pressures and institutional determinants of the formal wheat sector.

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We hypothesized that this set of drivers could have a higher explanatory power of the varietal diversity – i.e. based only on the varietal denomination which allows varietal choice by farmers – compared with the neutral genetic diversity. We confirmed that the main explanatory drivers – the cultivation area of bread wheat, the nature and the diversity of the preceding crops, and the pressure of some pathogens – explained the spatio-temporal structure of varietal diversity more than the genetic one.

We highlighted a correlation between bread wheat varietal and genetic diversity and a greater diversity of preceding crops, suggesting that more diversified agroecosystems seemed also promoted a higher within-crop diversity.

**Keywords:** Triticum aestivum L., varietal diversity, genetic diversity, temporal changes, spatial structure, cropping systems, preceding crop, pathogen pressures, institutional determinants of the formal wheat sector
Do males with higher mating success invest more in armaments?

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Variation in male reproductive behaviour may be a result of differential investment in traits involved in courtship and mating. Males with higher mating success would be expected to invest more in traits that facilitate mating, leading to steeper allometry of those traits with respect to body size. Across-population studies following latitudinal variation in male mating success are an excellent study system to address this question. In this study we used males of the damselfly Lestes sponsa to investigate whether the allometric patterns of the length and width of the anal appendages, used for grasping the female prior to mating, corresponded to male mating success. We hypothesised larger investment in the grasping apparatus, i.e. a steeper allometric slope, following higher mating success. Behavioural observations in field enclosures showed the highest mating success in the high latitude, while there were no significant differences between the central and low latitudes. We found positive allometry for the length of the anal appendages in high-latitude males, i.e. those males invested disproportionally more in the length of the grasping apparatus, while central- and low-latitude males did not show significant regressions of the traits on body size. Our results partially support our hypothesis, since high-latitude, more successful males invested more into the length (but not the width) of the grasping apparatus than central- and low-latitude males. Therefore, higher mating success might be facilitated by larger investment in armaments.

**Keywords:** male anal appendages, Lestes sponsa, allometry

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An endangered in the mountains: genomic diversity of the Pyrenean desman

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Next-Generation techniques have become a great tool to shed light onto the genetic structure of endangered species to help in their preservation. This is the case of the Pyrenean desman (Galemys pyrenaicus), which is a small semi-aquatic mammal endemic to the Iberian Peninsula whose populations have experienced a strong decline. Hence, the understanding of its genetic structure and evolutionary history is key to plan efficient conservation programmes. The main aim of this work was to study the population structure of the Pyrenean desman (Galemys pyrenaicus) using genomic sequences obtained from 26 samples from the whole distribution range using a double digest restriction associated DNA (ddRAD) protocol, which is a genome reduction approach used to sequence a large number of specific genomic fragments, optimized for small quantities of starting DNA. The genomic libraries obtained from this protocol were filtered with essential quality tests, the sex of the 26 individuals was determined and the proportion of heterozygous positions was estimated. Finally, the SNPs obtained shed light onto the population structure of the species. Although the sampling was scarce and some locations were not represented, we were able to test this NGS technique and shed light onto the population genomics of this endangered species. The results of this work could be used to develop new conservation strategies and, also, they open a promising path to perform deeper population genomic analyses with more sampling within this and other endangered species.

Keywords: Galemys pyrenaicus, ddRAD, SNPs, Conservation genomics, Genetic structure

*Speaker
First observation of tool use in wild pigs

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We report the first observation of spontaneous tool use in Suidae. Tool use has been reported in a wide range of vertebrates, and although pigs are generally considered to be "intelligent" animals, there appear to be no previous reports of tool use in Suidae. We report a series of observations and experimental interventions carried out at the Sus cebifrons enclosure in the Ménagerie of the Jardin des Plantes, Paris. Sus cebifrons, the Visayan warty pig, is a critically endangered wild pig native to the Phillipines. The Ménagerie has four, a mated male and female and their two adult female offspring. We first observed one of the Visayan warty pigs using a large piece of bark held in its mouth to dig with while making a nest pit in October 2015. The bark was used to dig backwards, similar to a rowing motion. This digging motion is very different from the rooting motion that the pigs use when digging with their snouts. During December 2015 we attempted to stimulate the tool-use behaviour by providing the Visayan warty pigs with various forms of enrichment. However, the nest pit building had stopped, and the enrichment attempt was not successful. We observed the Visayan warty pigs again in October 2016, and obtained video recordings of 3 of the Visayan warty pigs using sticks to dig with while building nest pits. They used the sticks with varying degrees of competency, suggesting social learning was occurring.

Keywords: Suidae, tool use, animal behavior

*Speaker
Plastic exploratory response to maternal and direct water stress in the common lizard

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Behavioral plasticity in response to water constraints is still overlooked compared to other environmental factors like temperature. Still, it exists empirical evidence of morphological or life history traits plasticity shaped by the interaction between the maternal hydric environment and the juvenile’s hydric environment. We got interested in the behavioral plasticity in response to maternal water restriction and different direct water availabilities. Half the pregnant mothers were water restricted compared to usual breeding water availability. We tested activity and exploratory behavior by recording videos of juveniles, in dry and wet soil conditions, at birth and at recapture after one year in semi-natural conditions. We mainly observed that animals explored more when they are in dry soil conditions at both ages, this is why we think it is a way to find a suitable habitat. We only observed that maternal water restriction enhanced thigmotaxis (i.e. the behavior described by a strong attraction to the walls) meaning that prenatal stress induced juveniles’ anxiety. The low repeatability of behaviors across trials at birth and the absence of correlations between behaviors at birth and at the yearling stage of life made us think that behaviors are highly variable at birth. We suppose that behavior has to be highly plastic to water constrains at birth to have the best response to a stressful environment (e.g. dispersal) and that consistent differences in behaviors, called personalities only develop later.

Keywords: exploration, water stress, behavior, thigmotaxis, personality

*Speaker
Ecology and reproduction biology of the black truffle Tuber melanosporum

Laure Schneider-Maunoury *

The black truffle Tuber melanosporum – the “black diamond” of French gastronomy – is an ascomycete fungus living in mycorrhizal symbiosis with tree roots. Few things are known about the ecology and biology of this iconic mushroom. The black truffle is potentially hermaphroditic but reproduction and formation of the edible organ, the ascocarp, require mating between individuals from opposite mating type: a maternal parent that forms the ascocarp flesh and a paternal one whose genes are only left in the meiotic spores within the ascocarp. Maternal genotypes are also found on the surrounding mycorrhizae, suggesting that maternal partners are established as symbiont on the host trees. In contrast, paternal genotypes are never found in mycorrhizae, and are more numerous and transient than maternal genotypes. Several questions arise therefore: what are the paternal partners (mycelium, spores...) and where do they come from? We conducted population genetics studies using microsatellites which revealed a high level of inbreeding, raising the question of the existence of gametic gene flow. Another mysterious aspect of T. melanosporum ecology is the presence of an area at the base of the host trees characterized by few herbaceous species, called a brûlé. Not a lot is known about causes or consequences of the brûlé, but it has been shown recently that, unexpectedly, T. melanosporum may be detected molecularly and genotyped within the roots of the herbaceous plants. We want to elucidate what kind of interaction is involved in this particular niche and whether paternal partners could be there.

Keywords: population genetics, fungal ecology, ascomycete, life cycle, microsatellites

*Speaker
Seasonal changes in morphology and performance in insular lizards: plasticity or survival?

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Previous studies have established that cyclical variations in the environment have important consequences on organisms. In temperate regions drastic changes in food availability can often be observed between seasons and are often accentuated on islands. Moreover, aggression and competition for reproductive partners mainly take place during a single season. Bite force is a fitness relevant performance trait that may also show seasonal variation. However, whether these seasonal changes are correlated to changes in the morphology of the underlying muscles and bony structures remains unknown. Here we provide data on seasonal changes in bite force, muscles cross sectional area and cranial shape in lizards of the species P. sicula from a small island in the Adriatic. Both bite force and the mass and cross sectional area of the jaw adductor muscles change seasonally with animals having greater bite forces and muscles in late summer relative to spring. These changes are accompanied by changes in the shape of the cranium and the mandible. As bite forces are greater outside of the reproductive season it is unlikely that these differences are due to sexual selection acting on male competitive ability. However, whether these results represent plastic changes in morphology and function from one season to the next or rather reflect differential survival of animals with greater bite forces remains to be tested.

*Speaker
Keywords: Phenotypic variation, seasonal changes, bite force, functional anatomy, 3D skull reconstruction
PARASITIC OVERVIEW OF ARDEIDAE IN THE NORTHEAST ALGERIAN WETLAND: LAKE TONGA (NATIONAL PARK OF EL KALÀ)

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Abstract

At the end of our work which consists of the very first time to make a monitoring on the number of endoparasites found in different organs mainly the digestive tract to some kinds of birds belonging to the family of Ardeidae, in particular ”Egretta garzetta”, ”Ardeola ralloides ” And ”Bubulcus ibis ”. We were also interested in the ectoparasite community in these specimens during year 2015-2016, at the Tonga Lake Ramsar site and integral area in the El Kala National Park, it is one of the wetlands The richest in Algeria. We have identified a very wide range of parasites which Coccidies is the most abundant, followed by Nematodes and Trematodes. All individuals were infested with a large number of parasites. As well as the collection of ectoparasites, allowed us to identify some dust mites and lice (Mallophaga) found on the bodies of birds.

Following the large number of parasites found, a histological study was carried out in order to understand and determine the lesions resulting from the action of pathogenic agents, thus the influence of various factors on their aspects, their development, their survival and persistence in our study site. These pathological analyzes have demonstrated multiple abnormalities detrimental to the health of this community.

This study provided important data which can be used for the implementation of action plans for the safeguarding, protection and conservation of ardeidae that are considered endangered.

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Keywords: Ardeidae, Lake Tonga, Inventory, Endoparasites, Ectoparasites, Histopathology.
The reproductive difference of pollinator and cheater on Ficus microcarpa

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The interaction between the hundreds of Ficus species and their specific pollinating wasps (Agaonidae) presents a striking example of mutualism. Foundress fig wasps pollinate fig flowers, and lay eggs in (and gall) some of them. Only three cases of cheating wasps (that fail to pollinate) have been reported, from two continents, suggesting that there is a cost to abandoning pollination. Reasons for the rarity of cheating is a major question in fig biology, because persistence of the mutualism depends on pollination. Here we compare reproduction of an undescribed Eupristina sp., a cheater that coexists with the pollinator Eupristina verticellata on Ficus Microcarpa in southwest of China. Despite a similar body size, female pollinators contained the same eggs with female cheaters. And cheater foundress oviposited more eggs and making more galls than pollinator, although not as twice as flowers were galled in figs entered by two foundress compared to one foundress, the number of galls increased significantly. Larval development was significantly higher for one foundress compared to tow foundress, independent of the species of foundresses. Cheater foundress succeeds in oviposition, making galls and the same larval development with pollinator suggests that no costs associated with cheating. While phenology observation shows these two species of wasps seldom coexisting in the same fig but coexisting in one crop fig of a tree, the community peak of pollinator and cheater taking place in turn in different month mean pollinator and cheater scattered in different figs, different season are the ideal strategies for stable coexisting.

Keywords: Agaonidae, Ficus, Galls, Mutualism, Species coexistence

*Speaker
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Individual body size is a key trait constraining interspecific interactions within food webs. It is particularly linked to individual metabolic rate. Because climate warming also affects metabolic rates, it creates direct selective effects on body size. Most experimental studies and empirical observations suggest that body size decreases under warming, though important exceptions have been noticed. Using a predator-prey model that is structured through the evolution of the predator body size, we try to reconcile these divergent results, by analyzing the conditions under which body size increases or decrease may be expected. Our model tackles three scenarios, linking predator attack rates to temperature changes in different ways (no thermal impact, exponential increase (Arrhenius function), modal function with a peak of attack rates at an optimal temperature). We then study the ecological and evolutionary dynamics of the system. The analyses reveal that evolutionary dynamics settle at a selected body size whose value only depends on the interaction rates (competition and attack rates). Only the third scenario is able to reconcile the seemingly opposite experimental and empirical results. Moreover, the general result of a decrease in body size may only be obtained if temperatures are above the species optimum, suggesting that current observations may concern systems that are already over-heating.

**Keywords:** Global warming, body mass evolution, adaptive dynamics, predator-prey interactions, attack rate
Dynamics of epistatic interactions under different environmental conditions in multicellular organism Caenorhabditis elegans

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Epistasis is the phenomenon of genes from different loci interacting with each other. It can be either positive (when double mutant shows less severe phenotype than it is expected based on single mutant phenotypes) or negative (when double mutant phenotype is more severe than expected from single mutant phenotypes). Epistasis is commonly known to influence many evolutionary processes, such as speciation, evolution of sex, genetic drift and most importantly epistasis can affect response to directional selection. In theory, positive epistasis is expected to reduce effect of selection in eliminating mutations whereas negative epistasis enhances it.

The aim of our study is to test how epistasis changes under harsh environmental conditions. To examine it we use well known, multicellular model organism – Caenorhabditis elegans.

Our query genes are associated with such processes as DNA repair, DNA damage, oxidative stress or heat shock response. To obtain double mutants we are inactivating genes using RNA interference (RNAi). We are feeding singly-mutated worm strains with bacteria engineered to produce dsRNA. Data from single mutants (either mutated worm strains or generated by using RNAi on wild type strain) serves us to compute expected phenotype for double mutants. Then, we observe whether phenotype of double mutant differs from the expected value. Experiment is done simultaneously in control and stressed conditions.

We are hoping that our experiment will broaden our understanding of how dynamics of epistasis under environmental perturbations can affect evolutionary processes.

**Keywords:** epistasis, genetic interactions, Caenorhabditis elegans

*Speaker*
Fluctuant Asymmetry of the Common Swift (Apus apus, Linnaeus 1758): A claim of value about the possible applications of population asymmetry parameters.

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For several years, researchers studying fluctuant asymmetry (FA) have been trying to find an individual asymmetry parameter and its relationship with fitness. However, recent studies have shown that such calculation was more complicated than what was suggested in the past. Alternatively, measuring FA at population level keeps being a relatively easy process, but it lacks the popularity possibly due to an insufficient emphasis of its possible applications. On a population of 56 common swift carcasses, we carried out the asymmetry analyses of five traits: maximum cord (MC), third primary (P3), carpus, eye-beak distance and tarsus. Through an external exploration and following necropsy, we evaluated: age, sex, body condition (fat stock, musculature, weight), immunity (spleen mass) and stress (gut parasites, visceral gout, respiratory system damage).

Feather traits (MC and P3) were the only ones showing FA (normal distribution, mean=0). They were also the least asymmetric, probably due to their biological role. The interaction "body weight – spleen weight" was the only stress agent that had a significant influence on MC asymmetry. P3 was not influenced by any of the measured parameters. No individual was significantly more asymmetric, making fitness comparisons excessively complex. Therefore, even though studies of individual asymmetry parameters have been very popular lately, FA analysis at population level are much easier to carry out and can be useful for identifying stressful environments that influence the common swift traits asymmetry. Also, since it is a widespread species, it could be a helpful parameter for habitat quality evaluations of humanized areas.

Keywords: Fluctuant asymmetry, Apus apus, environmental stress, body condition, immunity

*Speaker
Methods in Natural Sciences
Physico-chemical properties and heavy metals pollution of agricultural soils of SidiKacem-SidiSlimane (Morocco)

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As part of the preservation of water and soil resources for sustainable agriculture, a qualitative study of groundwater and soils of the Gharb irrigated perimeter (region of SidiKacem-SidiSlimane) was conducted. This study led us to assess the impact of intensive agriculture on the physico-chemical quality of these resources and assess their different uses.

The present work aims to study the soil contamination on a representative cultivated plot of the Gharb plain. A series of analyzes were conducted on 15 samples collected in the SidiKacem and SidiSlimane region. Sampling sites were located in a way to cover the entire SidiKacem-SidiSlimane region. Soil pH and conductivity were measured in a 1:5 soil-to-water suspension. The organic matter was estimated by loss on ignition. For the heavy metals analysis, soil was digested and analyzed by an inductively coupled plasma-atomic emission. All of the soils samples were analyzed to determine their total concentrations of Cd, Cu, Pb, Zn, Ni, and Cr.

Given the results of the analysis, the soils are neutral to moderately basic with low electrical conductivity. The organic matter content shows that our soils are considered as rich mineral soils. While investigating heavy metals in agricultural soils of the SidiKacem-SidiSlimane region and comparing the results with those of the literature, we note an insignificant metallic contamination. In contrast, farming practices, especially sewage irrigation, might play the most important role in Cd, Cu, Pb, Zn, and Cr accumulation in the soils of the study area.

Keywords: Gharb, agricultural, pollution, soil, heavy metals

*Speaker
A New Method for Understanding the Morphological Limitations of Short-Faced Temnospondyl Forms

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Skull shapes of short-faced temnospondyls show queer disparities. A new approach to compare the morphological limitations of those temnospondyl amphibians has been proposed. landmark based outline analysis, elliptical Fourier analysis, principle component analysis, construction of morphospace and analysis of convex hull area have been combined here using the R environment to develop this new method. Skull outlines of several brachyopid, chigutisaurid and plagiosaurid taxa as well as that of a few metoposaurids have been used for the pilot study. Morphospace and convex hull have been constructed from the skull shape outlines. Results depict sharp contrast between the morphospace and functional space in the case of brachyopids, chigutisaurids and plagiosaurids. Limitation of the available organismal designs helps to analyse the functional trait variation within this community. Forms with smaller orthogonal thickness of the posterolateral corners and forms with cheek emargination are less frequent in the geometric morphospace but prevalent in the functional space away from the main cluster. The convex hull area of the brachyopids are the largest with widely overlapping chigutisaurid forms. This indicates their close proximity in both morphological traits and functional space. Larger area in the convex hull depicts greater diversity but not greater frequency. Another highly conspicuous feature of the short faced forms are the orbits. In the morphospace of orbit outlines, the plagiosaurids occupied largest convex hull area followed by the brachyopids and the chigutisaurids. A similar study was constructed separately on the metoposaurids. No drastic disparity in the skull forms has been noted there.

Keywords: morphospace, convex hull, temnospondyl

*Speaker
Model organisms in ecology and environmental sciences: an epistemological perspective

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The expression ”model organisms” generally refers to organisms studied to provide insights for biological knowledge. Some typical examples include the fruit fly Drosophila melanogaster and the laboratory mouse Mus musculus. Two aspects can be distinguished in the classical notion of model organism. First, organisms are ”modeled” in laboratory: they are standardized and can be kept in experimental conditions. Second, they represent a ”model” because knowledge acquired studying them can be generalized to other species. For example, the phenomenon of crossing over discovered on Drosophila melanogaster has been used as a model to describe genetic mechanisms in other taxa. Thus, in this notion, both a ”technical” and ”epistemological” dimension can be distinguished. In ecology and environmental sciences, some organisms are also currently used as intermediaries to acquire knowledge about natural phenomena. In terrestrial ecosystems, trees represent essential tools for paleoenvironmental reconstructions via the study of growth rings by dendrochronology. In marine environment, several organisms (for example corals, otoliths and bivalve mollusks) are used for paleoclimatology and ecology via the techniques of sclerochronology. The aim of this presentation is to ask whether the classical notion of ”model organism” can be applied for this kind of organism used in ecology and environmental sciences. I will argue that this notion doesn’t apply because, for several aspects, they differ from models used in experimental biology. I will propose that model organisms used in ecology and environmental sciences could be named ”in situ biological models” to be distinguished from in vivo models used in experimental biology.

**Keywords:** model organisms, epistemology, dendrochronology, sclerochronology

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*Speaker
Evidence of morphological divergence in cryptic Mecopoda species using landmark based geometric morphometrics on external genital characters

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Traditional morphometrics on the five acoustically divergent populations of Mecopoda found in south India failed to yield any evidence for a distinct morphological identity of the songtypes. In the zones of their sympatric distribution, it is impossible to differentiate females into songtypes as they do not call and males can be positively identified only by their calls. In the wild, therefore, the songtypes of Mecopoda sp. forms a cryptic species complex. The advent of landmark based geometric morphometrics allowed me to compare the shape of cerci and the subgenital plate of all the Mecopoda songtypes. My approach was successful in distinguishing the Mecopoda songtypes with 89 % correct assignment of songtypes analysed using a machine learning algorithm. I speculate that since these two external genital characters are involved in mating and have sensory roles, the genital characters themselves might be involved in assortative mating. The differences I have observed may be enough to cause each songtype to reject a different songtype during copulation and the discrimination will most likely be of tactile in nature. Further work will be needed to establish whether the morphological distinctiveness I have identified drives reproductive isolation or has evolved subsequently as a result of restricted gene flow and rapid evolution of secondary sexual morphological traits within song types.

Keywords: Mecopoda, geometric morphometrics, speciation, Random Forest analysis, morphological divergence, relative warp analysis

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Statistical estimation and hydraulic simulation of Fash-flood risk in semi arid zone – Case of Ourika Valley-Morocco

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The development of statistical models and flood risk modeling approaches has seen remarkable improvements in their deliverability. Their application in arid and semi-arid regions and especially in developing countries can be extremely useful for better assessment and planning of flood risk in order to reduce the catastrophic impacts of this phenomenon. This study focuses on the SITI FADMA region (Ourika basin, Morocco), which is potentially threatened by floods and subjected to climatic and anthropogenic forcing. The study focuses on two main axes: (i) frequency analysis of extreme flow rates uses 11 probability laws adjusted by the maximization of likelihood method; (ii) mapping of the flood zone by a 2D IRic model, using the spatial high resolution digital elevation model (Lidar). The results show that Log Logistic law and the most adequate law to estimate extreme flows for different periods of return. Concerning the mapping of the flood-prone areas of a five-year flood, the study reveals that the extent of fluvial overflows along the banks of Ourika affects certain habitats, cultivated fields and the road that connects the valley to the city of Marrakech. The purpose of such a study is to develop new flood risk management techniques for better planning.

Keywords: flood, semi arid, model, frequency analysis, simulation

*Speaker
Optimization of sampling designs in eco-epidemiological studies based on antibody detection in sentinel species: the case of large gulls

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Wildlife disease ecology has been getting more attention notably because of emerging diseases threatening both human health and biodiversity. Widespread and opportunistically feeding seabirds such as large gulls may be of particular interest as they have the potential to be used as sentinels for the monitoring of various infectious agents. However, to efficiently estimate epidemiological parameters of an infectious agent in a population, sampling designs should be optimized by considering the trade-offs between estimation reliability and sampling efforts. Using a simulation approach, we compare the potential efficiency of different field sampling designs based on the detection of antibodies to estimate epidemiological parameters. We notably compare the benefits of including the tracking of individual exposure in a capture-recapture framework to a cross-sectional study. Moreover, we considered testing for the presence of maternal antibodies in egg yolk to quantify the exposure of breeding females to infectious agents. Our results stress that the optimal protocol will depend on the ecology of the host, the dynamics of its immune response and that of the considered infectious agent in the host population. These results are discussed in the light of field data gathered in the context of a long term epidemiological monitoring program of a yellow-legged gull (Larus michahellis) population. This allows us to conclude that large gulls and other related species could be useful wildlife sentinels for tracking certain infectious agents, notably by using offspring sampling as an alternative to adult blood sampling.

Keywords: eco, epidemiology, maternal antibodies, immunoassay, sampling strategy, simulation, large gulls

*Speaker
Comparison of in vivo data and morphological models of bite forces in various rodents.

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Bite force is widely used as a whole organism performance trait, either using in vivo measurements or models based on physiological cross-sectional areas (PCSA). The few studies combining both types of data have usually shown fairly robust correlations at the interspecific level (still with some inconsistencies). However, studies at the intra-specific level remain scarce. To investigate the relation between in vivo and modeled bite force, at both the intra- and inter-specific levels, we measured in vivo bite force in fourteen species of wild or lab-reared murid rodents. We also produced models of bite force using the PCSA technique. We then compare both datasets, using means for the interspecific analysis and individual values at the intra-specific level. We also try to find ecological and environmental factors (including lab vs. wild) that may influence deviations from the model predictions.

Keywords: Bite force, PCSA, rodents, ecology

*Speaker
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Sigmoid functions in ecology: where are we and where should we go?

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Despite repeated commitments to protect biodiversity, its decline is still ongoing. In order to monitor biodiversity, indicators are related to the aspect of biodiversity that is under evaluation. Linear relationships have been widely studied but they come with their limits. Such limits have been recognized for long in Island biogeography and the ensuing species-area (and species-resources) relationships (SARs). Thus some non-linear functions are used in SARs but their properties are not always adequate with the studied relationship. Finally, non-linear relationships with random effects have been very little explored and still present many difficulties. In order to improve these techniques, we are currently studying in a Bayesian context existing, as well as new, sigmoid non-linear relationships on two biodiversity data sets. The sigmoid function is S form with two horizontal asymptotes and a center of symmetry at the inflexion point. We are currently studying four already known functions – the cumulative Weibull distribution with three and four parameters, the logistic and the extreme value functions – and two new for ecology sigmoid functions with four and five parameters. The interest of these new functions is that each parameter is graphically identifiable and so each aspect of the sigmoid shape can be modified. The five parameters function allows in addition to obtain a non-symmetric form of sigmoid. We believe that these functions have a certain interest in applied ecology thanks to their great flexibility and therefore their capacity to adapt to various ecological phenomena.

Keywords: biodiversity, indicators, Bayesian statistics, sigmoid curve, random effects, SARs, non-linear functions

*Speaker
A new method for the characterization of botanical resources used for traditional East Asian handmade papers

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We tested the performance of pyrolysis-comprehensive two-dimensional gas chromatography/mass spectrometry (Py-GCxGC/MS) in the course of our cultural heritage studies, and compared its potentialities for the characterization of botanical resources used for traditional East Asian handmade papers. The evaluation of Py-GC/MS and Py-GCxGC/MS was conducted in considering the number of detected peaks, the compounds separation, the sensitivity, and the identification of marker compounds. The results showed that the number of plant markers (triterpenes and phytosterols) detected in Japanese reference papers made of kozo (Broussonetia kazinoki Siebold & Zucc.), mitsumata (Edgeworthia chrysantha Lindl.), and gampi (Wikstroemia sikokiana Franch. & Sav.) was improved in the pyrolysis fingerprint. With a gain in sensitivity in the order of six, the case study of a museum sample confirmed that Py-GCxGC/MS is more efficient for a reliable identification of material origins of museum collections samples and/or archaeological samples where tiny quantities of materials are the rule. The present study has been successful in refining a micro-destructive method based on analytical pyrolysis for the characterization of botanical resources used for traditional East Asian handmade papers by pyrolysis-comprehensive two-dimensional gas chromatography/mass spectrometry.

Keywords: pyrolysis, comprehensive two dimensional gas chromatography, East Asian handmade papers, micro destructive analysis, botanical resources characterization

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Virtual paleontology is a valuable technique for studying the history of life, and has enormous potential as a public outreach resource (Rahman et al., 2012). X-ray Computed Micro-Tomography (μCT) is a powerful non-invasive technique that allows the virtual observation of the internal and external structures of any type of sample in two-and three-dimensions (geological sample, mineral, fossil and extant specimens) (Cnudde & Boone, 2013). During a CT scan of a fossil, X-rays are passed through the specimen while it rotates around 360°, the extent to which the X-rays are attenuated (absorbed or scattered) by the sample is mapped in three dimensions using a computer algorithm (Rahman et al., 2012). Reconstructed tomographic data then can be qualitatively evaluated in any orientation, colored, virtually dissected, and made locally translucent. Details and structures of interest can be segmented and virtually extracted without any risks for the original sample. Finally, quantitative analyses can be performed in 2- and 3D (Sutton 2008; Garwood et al., 2010).

More than twenty specimens from the formation of Fezouata (Central Anti-Atlas, Zagora, Morocco) were therefore scanned by using μCT at the University of Poitiers (France): some of these specimens have revealed excellent internal details while others do not display sufficient absorption contrast to reveal any internal structures. Nevertheless, these μCT record produces in either case 3D models of fossils which can be a resource that will allow anyone, to interact with rare and precious fossils and can be used for the purposes of research education and preventive conservation.

**Keywords:** X, ray Computed Micro, Tomography, conservation
Structural equation modeling of pro-biodiversity behaviors toward pollinators

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As individuals are more and more requested to take part in the environment’s protection, understanding their motivations to do it might help designing relevant protection’s programs. Theories such as Stern Value-Belief-Norm (VBN) theory or Ajzen Theory of Planned Behaviour (TPB) showed success in explaining pro-environmental behaviours. More recently, Structural Equation Modelling (SEM) allowed a new synthesis of these theories. Pollinators are one biodiversity object drawing attention nowadays and we choose them as focus for pro-biodiversity behaviours in our study.

We applied the work done in previous study, and the models synthetizing TPB and VBN. Some of these studies included habits related to the behaviour as direct predictors of it. We took into account more general habits (gardens habits, consumption habits related to biodiversity) in order to evaluate how a general orientation in favour of biodiversity will impact specific behaviours in favour of pollinators. We hypothesized that their places are as direct predictors of intention. We used a measure of concern for biodiversity to take into account VBN’s awareness of consequences and ascription of responsibility toward the environment, in order to try to find a simplified way to express them for biodiversity.

The SEM partially validated our model. The structure resulting for the previous studies was validated with our data, including our simplification for the ”level of concern for biodiversity”. We validated the inclusion of pro-biodiversity consumption habits into the model. Inclusion of garden habits and phytosanitary related practices was not granted.

Keywords: structural equation modelling, pro biodiversity behaviors, theory of planned behaviour, value belief norm theory

*Speaker
Proteomics for archaeology: identification of small bovid dental remains from Leopard Cave, Namibia

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Distinguishing between goat (Capra hircus) and sheep (Ovis aries) bone remains is a tricky task in zooarchaeology due to high morphological similarities. In austral Africa, the distinction between the two species could give information about the first introduction of domestic animals in prehistorical societies. Here, we report the use of proteomics on three teeth identified as caprines and coming from the LSA site of Leopard Cave, Namibia. These remains were previously dated as the oldest of austral Africa (end of third millennium BP) by radiocarbon. Four modern samples of African small bovids (domestic and wild) were also included in the study for comparison. We first estimated the collagen preservation on small amounts of tooth powder by infra-red spectroscopy ATR-FT-IR. We then optimised the protein extraction based on a previously published protocol. The tryptic digest was analysed using nanoLC-nanoESI-MS/MS and MALDI-MS/MS. The resulted spectra were screened using Mascot and Peaks software. Beside the identification of the two chains of type I collagen, two non-collagenous proteins were also identified. We could not discriminate between the species based on the collagen peptide detected, due to low sequence coverage of both chains. However, it seems that alpha 2 HS glycoprotein and secreted phosphoprotein 24 present more variations between the bovid species, which was not reported in any previous paper. The results, although preliminary, suggest that the dental remains could in fact belong to a wild bovid species. Further analysis will be necessary in order to discriminate surely between the different bovid species of interest.

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Keywords: archaeology, mass spectrometry, Africa, sheep, goat
DNA Barcoding Evaluation and Phylogenetic Relationship Implications in Lauraceae from China

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Lauraceae are important component of tropical and subtropical forests and have major ecological and economic significance. Owing to lack of clear-cut morphological differences between genera and species, this family is an ideal case for testing the efficacy of DNA barcoding in the identification and discrimination of genera and species. In this study, we evaluated five highly regarded plant DNA barcode loci matK, rbcL, trnH-psbA, ITS and ITS2 for 412 individuals in 133 species belonging to 12 Chinese Lauraceae genera. We tested the ability of DNA barcoding to distinguish species and as an alternative tool for correcting species misidentification. The rbcL+matK+trnH-psbA+ITS loci were used to investigate the phylogenetic relationships of the species examined. Among the gene regions and their combinations, ITS was the most efficient for identifying species, with the rbcL+matK+trnH-psbA +ITS combination also giving relatively satisfactory results. Nevertheless, total error rates were still high and these had a measurable impact on plant classification. Based on the results of the phylogenetic analyses, Chinese Lauraceae species form three supported monophyletic clades. This study shows that molecular barcoding can assist in screening difficult to identify families like Lauraceae, detecting errors of species identification as well as helping to reconstruct phylogenetic relationships. DNA barcoding can thus help with large-scale biodiversity inventories and rare species conservation by reducing time and costs associated with species identification.

Keywords: DNA barcoding, Lauraceae, identification, phylogenetic relationships

*Speaker

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Identification of devitalization methods on trees which induce risks on dikes and dams

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The woody vegetation implanted on dikes and dams and is well known for many positive effects on these areas (bank stabilization, biodiversity, shade...). Thus, managers have left trees growing on these sites. But, recent studies show that trees and specially root system may cause various damages like uprising and deconstructions leading to various risks for hydraulic structures (internal and external erosion risks). Therefore, a strengthening of the regulation on dikes and dams forced managers and owners to ensure the control, the technical monitoring and the necessary maintenance of their structures. With the forbidding of the use of chemical products near watercourses, this thesis focuses on the search of alternative methods of devitalization of young trees. Indeed, regulations in constant evolution forced to change usual practices so managers are confronted to an important problem of vegetation development on their dikes and dams. It is urgent to set up preventive management techniques of young trees which potentially could constitute a risk when they grow up. The first axis consists to make a screening in greenhouse of possible and effective methods on various tree species found on hydraulic structures. The second axis aims to put in place selected methods on sites and, at the same time, optimize methods according to specific parameters. Management plans must be elaborated in order to conciliate security, environmental and landscape issues. The final goal of this applied research will be to propose to hydraulic structures managers new solutions both respectful of the environment and in accordance with regulatory framework.

Keywords: tree management, risks, tree devitalization, dikes, dams

*Speaker
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Importance of using Geographic Information System for the Middle Palaeolithic sites in Northern France. The example of Caours (Somme, France) and Beauvais (Oise, France).

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During the middle Palaeolithic, the northern France was only occupied by Neanderthals groups. However, successions of glacial and interglacial cycles explain a complex and discontinuous settlement, raising complication in the study of its dynamics at a regional scale. Therefore, some aspects of Neanderthals behaviour are still mischaracterize: in most cases, the function of the site and its territorial management over the northern France have to be specified. The spatial analysis of open air sites from northern France will help us to answer those questions. However, for Middle Palaeolithic sites, we can’t see systematically on the field the spatial organisation directly, we sometimes need modelization. Therefore, we started to build a spatial analysis protocol adapted to this site and applied to such sites. The sites of Caours (Somme, France) and Beauvais (Oise, France) are two open air sites that are exceptionally well preserved and displaying a large amount of faunal and lithic rests. Both are perfect candidate to apply and test the new protocol. First results proved that for each site the existence of a spatial organisation as remains concentration zones. Then, we characterize this areas – number, distribution. Finally, we were able to associate them to human activity areas like hearths, butchery or knapping areas.

**Keywords:** Spatial analysis, Middle Palaeolithic, Neanderthal, Northern France, Archaeozoology, Hearth

*Speaker
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First paleohistological inference of resting metabolic rate in an extinct synapsid, Moghreberia nmachouensis (Therapsida, Anomodontia).

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The acquisition of mammalian endothermy is a major event in evolution of vertebrates since it modified the energetic relationships between organisms and their environment. While avian endothermy is assumed to occur at the archosauriform node, the acquisition of mammalian endothermy is poorly constrained both temporally and phylogenetically. Bone histology provides both qualitative and quantitative paleobiological information contrary to anatomical traits. It is a useful method to infer the bone growth rates and resting metabolic rates of extinct vertebrates. First, the histology of the Triassic Moroccan dicynodont Moghreberia nmachouensis indicates the presence of incipient fibro-lamellar bone (FLB) in humerus and femur suggesting a high growth rate. Observations on two related dicynodonts would imply increasing growth rates from Moghreberia to Lystrosaurus (well-developed FLB in femur and incipient FLB in humerus), to Oudenodon (well-developed FLB in stylopods). Moreover, we performed the first quantitative inferences of resting metabolic rates on fossil synapsids (Moghreberia as a model and Lystrosaurus and Oudenodon for comparative purposes) using quantitative histology (osteocyte lacunae size, shape and density) combined with phylogenetic eigenvector maps. Our inferences are consistent with the qualitative histology: the mass-independent resting metabolic rate inferred for Moghreberia nmachouensis (2.58 mLO2h-1g-0.67) is lower than the value inferred for Lystrosaurus (3.80 mLO2h-1g-0.67), which is lower than that inferred for Oudenodon (4.58 mLO2h-1g-0.67). Optimization of these inferences onto a phylogenetic tree of amniotes using the parsimony method allowed us to better constrain the temporal (more than 260 My ago) and phylogenetic (Neotherapsida) frames of the acquisition of mammalian endothermy.

**Keywords:** Dicynodontia, Endothermy, Fibrolamellar bone, Paleohistology, Phylogenetic eigenvector maps

*Speaker
Appearance management of 2.5D printing for accurate reproductions of artifacts from natural history and museum collections

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Most heritage pieces have a dimensionality that cannot be conveyed in a flat 2D print on paper or board, which is composed of varying depth and different appearance effects such as texture, sheen or luster.

The area of 3D prints had found a place in museums and cultural heritage centers with the scanning and replication of original pieces creating an alternative way of both viewing and experiencing their collections first hand. However technology advancements in 3D printing have concentrated on building functional objects where aspects such as color, detail resolution and other important material appearance properties have been neglected.

Here we present a relief or 2.5D printing technology that offers the subtleties that 3D printing lacks. We refer to 2.5D printing as the process by which a protruding surface is created by laying down successive thin layers of ink until a desired colored surface texture is achieved. The high accuracy of dot positioning and the size of its subset of colors make this technology suitable for aesthetic applications.

With 2.5D printing, new challenges arise as color is no longer the main parameter to assess quality and beautifulness of a reproduction, other aspects such as physical texture, detail rendition, glossiness and translucency are equally important.

In this presentation, we introduce 2.5D printing and expose the limitations of existing tools managing appearance going from 2D to 2.5D. Then we show methods for accurate control, prediction and measuring of aspects linked to the visual perception of a real object.

Keywords: 2.5D printing, visual appearance, cultural heritage, reproduction

*Speaker
Using tropical snails as proxies for the atmospheric radiocarbon concentration

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In Brazilian archaeological shellmounds, many species of land snails are found abundantly distributed throughout the occupational layers, forming a contextualized set of samples within the sites and offering a potential alternative to the use of charcoal for radiocarbon dating analyses. Nuclear testing around 1950 produced considerable amounts of radionuclides in the atmosphere. The quantity of 14C, for example, almost doubled in the Northern Hemisphere and, since then, the ocean and terrestrial biosphere removed most of this anthropogenic radiocarbon from the atmosphere. Therefore, bomb radiocarbon entered the global carbon cycle and has been widely used as a tracer for a variety of processes. In this study, in order to confirm the effectiveness of terrestrial mollusk shells as proxies for the atmospheric carbon reservoir, 18 shells with known collection dates from 1948 to 2004 AD, around the nuclear bombs period, were radiocarbon dated. The obtained dates fit the SH1-2 bomb curve within less than 15 years range, showing that certain species from the Thaumastus and Megalobulimus genera are reliable representatives of the atmospheric carbon isotopic ratio. This has strong implications for fields such as Archaeology and Environmental Science.

Keywords: radiocarbon, mollusk, south america, archaeology

*Speaker
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Insects of forensic importance: faunal succession, morphological and molecular identification

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Necrophagous insects among Diptera and Coleoptera are the most significant in estimating the minimum postmortem interval (PMImin) especially during the early stages of decomposition and the entomofaunal succession is reserved for longer elapsed time since death. In order to constitute a database of forensic relevance, pig carcasses were put in five different locations in Lebanon. Insects were collected and identified using their morphology. Calliphorid flies were identified at the molecular one. Sarcophagidae species were more diverse but less frequent than calliphorids. *Chrysomya albiceps* was the most abundant calliphorid due to its predatory behavior. The duration of its life cycle changes upon different environmental conditions of the experiment. Among the identified Coleoptera, the genus *Saprinus* was the most diverse and *Dermestes frischii* among dermestids was frequent under all experimental conditions. Only in one locality, viz. the pine tree forest of Naas – Mount Lebanon, two species of the necrophagous beetle family Silphidae were collected. To eliminate the difficulties in the accuracy of species identification for damaged specimens and immature ones, DNA barcoding of COI gene was carried on specimens of the three genera *Chrysomya*, *Calliphora*, and *Lucilia*, frequently found in Lebanon. We used Cyt-b-tRNAser-ND1 and ITS2 genes to confirm the identifications, and study the interspecific differences. Our results support the utility of these genes for species identification of these flies in Lebanon and the sequences will be deposited in Genbank. Rigorous research at both morphological and molecular levels will be the most important factor that support forensic entomology field in Lebanon.

**Keywords:** Necrophagous, minimum Postmortem interval, DNA, barcoding, Calliphoridae, Silphi-
Measuring physical performance and reaction to stress in mouse lemurs: bite force transducers, microphones and infrared cameras.

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Sexual size dimorphism is not common in strepsirhines but has been observed in wild grey mouse lemurs (Microcebus murinus). Sexual dimorphism in bite force was moreover observed in captivity and is determined by head dimension. This finding invited us to investigate the role of the ecological niche in differences between males and females, but no data on bite force in free-living animals are available to date. Prior field studies only focused on aging of grip strength in males and females, showing that wild males declined slightly, and that females were stronger than males in the grey mouse lemur. However, no sexual dimorphism was described in the other mouse lemur species.

Here, we collected data on a wild population of brown mouse lemurs (Microcebus rufus) in the rain forest of Madagascar using direct methods: bite force measurements with a portable bite force transducer, head dimensions, weight, and heart ratios using a microphone. We also conducted an explorative work with infra-red pictures aimed to test the correlation with the level of stress experienced during manipulation.

We found that brown mouse lemurs do not present sexual dimorphism in bite force and head width. Bite force was positively correlated with head width as previously demonstrated for grey mouse lemur. Interestingly, we found that heart ratio was negatively correlated with bite force, but also tended to be negatively correlated with maximum eye temperature, a known marker of response to stress in homeotherms. This help us to understand how this prey species reacts in stressful conditions.

Keywords: mouse lemur, bite force, eye temperature, heart ratio

*Speaker
Preliminary study on the microanatomical and geometrical characteristics in long bones shaft among mammals

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Bone microstructure in mammals provides evidences of tight functional and evolutionary relationships between the inner structure of bones and the organisms’ lifestyle. Indeed, it has been shown that locomotion habits can be inferred given the microanatomical patterns, especially in long bones. Although most past studies were based on qualitative and quantitative analyses of transversal sections of the shaft on homologous plans, the variation of the inner structure all along the shaft and its quantification remains to be specified. We used a dataset representing a large diversity in ecology, microanatomy and morphology among mammals, in order to determine relevant quantitative microanatomical and geometrical parameters capable of describing at best the microstructural variations along the shaft. In this purpose, both femora and humeri of 16 mammal species were scanned using a microtomographic approach (CT scan), and reconstructed to analyze bones in three dimensions. We then precisely quantified and compared several parameters related to the bones’ microstructure. Here we provide first conclusions of the relevance of these parameters, such as geometrical variation of shape along the shaft, or variation of the compacity. These study would allow us to conduct further comparative microanatomical studies within mammals.

Keywords: Bone, microanatomy, microtomography, 3D reconstruction, functional anatomy, mammals

*Speaker
Use of microtomography analysis as a tool to understand the interaction between parasitic plants and their hosts

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Parasitic plants are angiosperm species that attach to other plants, i.e. hosts, in order to obtain nutritional resources. The attachment is provided by an organ called haustorium, which bridges the parasite and the host, thus promoting the flux of various substances between the two plants. Despite carrying out the same basic functions in all parasitic angiosperms, haustoria can be greatly diverse among parasites considering its morphological and anatomical features. As a way to analyze this organ which "embodies the very idea of plant parasitism", we have allied traditional plant anatomy with the use of High Resolution X-ray Computed Tomography (HRXCT) providing a detailed three-dimensional understanding of the host-parasite interface. Our study included parasitic plants that infest the host stem by forming one or two general types of haustoria – terminal ones, and lateral ones. Additionally, different scanning methods and contrasting agents were tested in order to improve the detection of parasitic tissue within the host stem/root. A total of 12 species from 5 different plant families were analyzed. The results indicate that species that only form terminal haustoria have different infestation patterns within the host. On the other hand, species forming both haustorium types showed similar patterns of host stem infestation. The HRXCT proved to be a powerful approach to understand the haustorial system and the infestation patterns of parasitic plants. We hypothesize that the development of distinct types of haustoria could be related to other anatomical and physiological features of parasitic plants.

Keywords: haustorium, plant anatomy, microtomography, Loranthaceae, Viscaceae, Apodanthaceae, Cuscuta, Cassytha

*Speaker
A novel spatially resolved force sensor for biomechanics: implications on the evolution of locomotion and grasping in Primates.

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Biomechanical and behavioral studies allow investigating the evolution of locomotion, postural patterns and grasping abilities. Also, connecting biomechanical function to limbs’ shape and skeletal features is instrumental for reconstructing locomotion and behavior of extinct species. In the context of ancestral Primates’ locomotion, it is still unclear how the possession of nailed feet with an opposable big toe, associated with an arboreal way of life, have evolved within this group. The spatial repartition of forces applied by hands and feet during arboreal locomotion is a central mechanical cue which largely remains unknown and difficult to reach with current methodologies. Existing devices are either uni-dimensional (pressure sensors) or non-spatially resolved and therefore cannot reveal the tangential component of forces, crucial in arboreal locomotion. Here, we designed a new force sensor device, affordable, portable and resistant, allowing us to obtain in situ, for the first time, the repartition of both the pressure and the direction of forces applied, with a resolution of a few millimeters. This new technology that we patented can produce in real-time precise maps of forces exerted on the limbs during locomotion. A first experiment using this methodology was conducted on two Lemur species (Hapalemur griseus and Eulemur mongoz) using a ”branch-shaped” sensor. The first results will be presented, as well as their implications for Primate evolution, biomechanics in general and for other fields like robotics.

Keywords: Biomechanics, Force sensor, Locomotion, Primate, Grasping.
Growth-Climate Relationships of Tetracentron Sinensis in the Ailao Mountains, SW China

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This study aims to develop tree ring-width chronology of Tetracentron sinense in the subtropical evergreen forest of Ailao Mountains, SW China, and to analyze the responses of radial growth to climate factors. This study explore the potential for reconstructing the past climate and provide basic information for modelling species distribution of T. sinense and its biological conservation under future climate change. We developed the first tree ring-width chronology of Tetracentron sinense in Ailao Mountain. Correlation analysis between tree ring-width chronology and climate factors showed that the radial growth of T. sinense was significantly correlated with mean temperature from February to June of the current year. Precipitation has negative effects on growth of T. sinense, although the correlations are generally weak. Moreover, ring-width chronology showed significant positive correlations with February sunshine durations, but negative correlations with February-March relative humidity. Our study demonstrated that multiple climate factors influence radial growth of T. sinense in Ailao Mountains, with climate conditions during the early growing season is crucial for the growth of T. sinense. This study showed that T. sinense in the subtropical Ailao Mountains produce distinct and cross-datable annual growth rings. Tree ring-width chronology of T. sinense preserves considerable climate information, which has high potential for reconstructing the past climate change in the study area.

Keywords: Tree rings, Tetracentron sinense, Climate factors, Radial growth, Subtropical evergreen forest
Quartz morphoscopy in environmental determination of alluvial deposit in Rizal excavation site, Philippines

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The studied excavation site is located in northern city Rizal in Philippines (Ingicco et al, 2015). Detailed sedimentary facies studies of the basin have been developed in 1981 by Mathisen and Vondra (1981). After the discoveries of fossil bones, a more comprehensive study has been developed in the year 2014-2015 by Ingicco et al (2015). However, it is still not clear if the entire fossiliferous layer F2 is homogeneity especially there is a natural trench divided the layer into 2 sections. From appearance, Section 1 Hell Trench (HELL) is sandier than the section 2 the excavation site itself (BED).

The purpose of this research is to know if the two sections (HELL & BED) from one layer F2 is homogeneity or not. In order to get powerful results, several supporting methods are applied to deal with this problematic: X-ray Diffraction (XRD), Grain size characterization Quartz morphoscopy, .

XRD is used to determine the mineralogical composition of the raw material components as well as qualitative and quantitative phase analysis of multiphase mixtures. We could know the physical property and then interpret the sediment and dynamic conditions of transportation and deposition from grain size characterization. Quartz morphoscopy based on the principle that available information can get through the observation and analysis of shape characters on a microscopic scale of quartz grain. Such as the existence of pyramid quartz is believed from volcanic origins.

With combing these three methods, a throughout analysis and reliable homogeneity or heterogeneity result can get.

**Keywords**: Quartz morphoscopy, Grain size characterization, XRD, Homogeneity
PROCESS WATER RECYCLING IN A COMPLEX SULPHIDE ORE FLOTATION

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Semi arid climate of Morocco makes water as a limited and precious resource. Because of the increasing demand for water from all sectors of the economy and the variability in supply, efficient management of water resources is of vital importance. The national water reform agenda has provided a strong impetus to all users to progressively move toward more efficient and sustainable water management. Like other water users, and for economic and environmental reasons, mineral processing plants (crushing, flotation, separation...) reuse more water to reduce simultaneously fresh water demand and the discharge of waste water in the environment. However, the reuse of the flotation process water can negatively affect its quality and hence the performance of the mineral separation. Indeed, the increase in the amount of recycled water increases the organic (reagents) and inorganic charge (suspended matters, cation, and anion) of the water process which has often a negative impact on the different processes. In this study, an attempt was performed to assess the possibility of recycling waters from tailings dam in lead flotation circuit of la Société Minière des Guemassa, Morocco. The optimization of the process water quality, showed that fresh water consumption could be reduced by its substitution with tailings one

Keywords: water quality, process water recycling, flotation, sulfide ores, optimization.

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