

Table of contents

I-1. Theory, methods, techniques of archaeology	3
”Diet and social organization in groups of hunter-gatherers of the archaeological sites of Tequendama and Aguazuque during the early and middle Holocene in the Bogotá savanna”. Analysis of phytoliths and stable isotopes., Angelica Triana [et al.]	4
A cognitive approach to the sensibility to the pottery in prehistoric funerals, Makoto Tomii	5
Archaeological site Casa Grande: A case study of underwater archeology in the State of Goiás, Brazil, Wilian Vaz-Silva [et al.]	6
Differential evolution of cerebral and cerebellar fossae in recent Homo: A new methodological approach., María Asunción Cabestrero-Rincón [et al.]	8
Digitization, reconstruction and spatial analysis of the archaeological record of the Middle Paleolithic site of Jarama VI (Valdesotos, Guadalajara, Spain), Jesús F. Jordá-Pardo [et al.]	9
From Surface Collection to Microwear Analysis: A Reappraisal of the History of Researches on Prehistoric Polished Stone Tools in Eastern India, Paromita Bose [et al.]	11
Integration of microscopy, geometric morphometrics and machine learning classification algorithm for the identification of hand preference from stone tools, Alice Rodriguez [et al.]	13
Interdisciplinary studies of the settlement micro-region in Ulów, Middle Roztocze (SE Poland) - problems, results and perspectives, Barbara Niezabitowska-Wiśniewska	15
L’adaptation de sociétés paléolithiques à leur environnement : de l’art de malmener les concepts et de poser les mauvaises questions ?, Laure Fontana	16

Le travail du bois dans la Préhistoire: les chaînes opératoires de la fabrication d'artefacts meubles et immeubles., Mariel Bencomo Viala [et al.]	17
Les habitats désertés de la région d'Akoupé (Sud Côte d'Ivoire) :une opportunité pour la reconstitution des savoir-faire céramique en contexte forestier, Clarisse Larissa Yapo	18
Méthode d'étude archéostratigraphique d'un site préhistorique. Mise en évidence des niveaux d'occupation de la grotte des Ramandils (Port-la-Nouvelle, Aude, France)., Véronique Pois [et al.]	19
New methods for the structural conservation of the fossil substrate, Jose Pozo Canales [et al.]	21
Paleoparasitology, Alizé Hoffmann	23
Parietal art of Kapova cave: the difficulties in documenting the wall paintings in 1960-2010, Yulia Kuzminova [et al.]	24
Paths in the landscape: Rock art as a tool to track past information networks, Vivian Scheinsohn [et al.]	25
Quantitative approach to the study of Neolithic projectile point of South-Eastern Arabia: a new systematic description, Maria Pia Maiorano [et al.]	27
Tenir compte des imprécisions chronologiques dans les décomptes d'évènements archéologiques par pas de temps, Bruno Desachy [et al.]	28
Theoretical approaches to the evolution of emotional cognition: Can the archaeological record help us to understand how human altruism evolved?, Penny Spikins [et al.]	29

I-1. Theory, methods, techniques of archaeology

”Diet and social organization in groups of hunter-gatherers of the archaeological sites of Tequendama and Aguazuque during the early and middle Holocene in the Bogotá savanna”. Analysis of phytoliths and stable isotopes.

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Summary:

Some archaeological studies on the processes of social change from pre-agricultural societies that existed during the early and middle Holocene in Colombia, have taken place in the Sabana de Bogotá (Colombia). The research carried out by Correal and Van der Hammen (1977) and Correal (1990) in the archaeological sites of Tequendama and Aguazuque are examples of this. These authors picked up important information from lithic artifacts, plant remains, ceramics, and human and animal skeletal that produce information about the life forms of humans who inhabited these sites.

In 2014 a new study focused in the re-excavation of the Tequendama and Aguazuque sites through nine columns of 50x50 cm. This excavation was carried out in order to obtain archaeobotanical information as well as to evaluate the existence of feeding patterns and the resources obtained by two individuals. This study was based on the analyses of stable isotopes, skeletal remains of fauna and phytoliths present in sediment, dental calculus, and lithic artifacts.

So far, the results indicate that the phytoliths in the sediment samples are the evidence of an arbolreal vegetation and grassland. In addition, the skeletal of animals indicates the presence of *Odocoileus virginianus*, *Cavia* SP, and in smaller proportion, CF Dasyproctidae and Dasyproctidae.

Keywords: diet, social organization, Holocene

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A cognitive approach to the sensibility to the pottery in prehistoric funerals

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In the funerary context, pottery served as a container for offering, as an urn, and/or as a prestigious grave-good in itself, from prehistoric time onwards. Some pots might have been produced for such purpose, while others might have been converted from a vessel for daily use. In any cases, the agent of the funeral placed the pot for the dead in or around burial, with care not to break. She/he must have hoped such context of pottery deposition undisturbed forever, by the nature of burial. In this presentation, by collating contextual photographs of the pottery deposition taken during the excavation with photographs of the pottery from all directions taken after refitting with glue, I try to examine her/his sensibility to the funerary pot; whether, or not, she/he was aware of a particular side of the deposited pot as the front (or the back).

Meanwhile, in the prehistoric funeral, even the pottery with discoloration on its surface that had been caused during the production stage of its life-history was used. Discolouration on pottery surface often occurs during production in the case of open-firing. A black patch might be aesthetically the worst case. Discolouration sometimes occurs on the surface of kiln-baked pottery because it is very difficult for potters to precisely control the heat of the fire, not only in open-firing but in kiln baking. Here, from the viewpoint of cognitive archaeology, the agent's way of coping with such pottery for deposition in funeral is worthy of consideration.

The material of the case study in this presentation is from the Japanese prehistory, but the method of examination of the sensibility is applicable to various types of the prehistoric funerary context with pottery.

Keywords: funerary, pottery, deposition, cognitive approach

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Archaeological site Casa Grande: A case study of underwater archeology in the State of Goiás, Brazil

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Underwater Archeology is a field of research that uses specific methods for the study of archaeological sites submerged or closely related to aquatic environments. The conservation of submerged archaeological artifacts has an interdisciplinary character and is an incipient theme when considering studies addressing submerged artifacts in freshwater environments. The goal of the study was to gather information about the conservation of the archaeological site Casa Grande after its flood to the formation of the water reservoir of the João Leite stream, through inferences on the deposition process and type of sediment, bioturbation, and physicochemical parameters of water. The results showed that the Archaeological Site Casa Grande is in good condition after six years of flooding. The artifacts found through underwater prospecting were classified into five categories, the most representative category being ceramic pottery (bricks and tiles). The granulometric analysis showed that the sediment deposited in the artifacts was composed of very fine sand (65%), silt (25%) and fine sand (10%), with brown dark grayish (dry sediment) and brown very dark grayish (humid sediment). In relation to bioturbation, the community analysis of benthic macroinvertebrates showed a community depleted with the dominance of two species of exotic molluscs (*Corbicula fluminea* and *Melanoides tuberculata*), larvae of Chironomidae, and Oligochaeta, which together with *Macrobrachium amazonicum* (freshwater shrimp) and fish species abundant in the area, provide alteration in the deposition of the sediment before the behavior of foraging of the species. The physicochemical parameters of the analyzed water evidenced variation in the profile (depth) and seasonal, suggesting that artifacts in different depths are subject to different effects considering the physical-chemical and biotic pressures of the environment. The lack of hydrosedimentology and hydrosedimentometry data of the water reservoir makes it difficult to discuss the burial of archaeological remains and a long term projection. The results presented in this study give support to future research in the site Casa Grande, with great potential for the study of ceramic pottery artifacts in the context of Architecture Archeology, and encourages discussion on decision-making in relation to archaeological rescues at sites undergoing permanent flooding.

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Keywords: Historical Archaeology, Bioturbation, Conservation.

Differential evolution of cerebral and cerebellar fossae in recent *Homo*: A new methodological approach.

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The endocranium shows the influence of the shape and development of brain tissues and overall brain modifications. During the late Upper Pleistocene and Holocene smaller brains appeared (Weaver, 2005) and the higher position of endinion relative to inion might indicate changes in cerebellar and occipital lobes. In previous studies, the depths of the cerebral and cerebellar fossae were not specifically considered; new tools for quantitatively measuring these irregular, problematic curved areas need to be developed. This paper's main objective is to investigate to what degree have occurred changes in the fossae's depths of extant humans with respect to fossil Anatomically Modern Humans (AMH) and older *Homo* species. The proportions of the occipital and nuchal planes are compared measuring the inner and outer surfaces of the bone. Additionally, this paper proposes a quantitative geometric methodology based on endocranial landmarks that create a plane with which to measure the position of the deepest part of the fossa: it represents a curvature maxima –concavity- associated with local structures. The four points thus obtained could be framed in Bookstein's Type II landmarks (Bookstein, 1991), but without biomechanical implication. Through univariate, bivariate and multivariate analysis (Principal Components Analysis) of raw and size-corrected data we look at the differential evolution in recent *Homo* species, which present a more vertical occipital area than ancient fossils. Our results corroborate this derived trait; additionally, we observed a tendency towards a relative decrease in the profundity of the cerebral fossae and maintenance of the cerebellar ones.

Keywords: occipital bone, cerebral and cerebellar fossae, recent *Homo*

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Digitization, reconstruction and spatial analysis of the archaeological record of the Middle Paleolithic site of Jarama VI (Valdesotos, Guadalajara, Spain)

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Jarama VI is located on the NW edge of the Guadalajara province (Castilla–La Mancha, Spain). It is a rock shelter partially filled up by sediments which were excavated between 1989 and 1994. The archaeological excavation shows a lithostratigraphic sequence formed by three Pleistocene sedimentary units (Jordá 2007) with thousands of archaeological remains of the Middle Palaeolithic (Navazo *et al.* 2017) with an age older than 50 ka BP (Wood *et al.* 2012; Kehl *et al.* 2013; Higham *et al.* 2014) and even a bone remain of *Homo neanderthalensis* (Lorenzo *et al.* 2012). These human occupations correspond to later Neanderthal populations who lived in central Iberia many years before the arrival of the first modern humans to this area (Cacho *et al.* 2012). During this last year we have reviewed the traditional archaeological record of the excavation (excavation diaries, inventories of materials, drawings of stratigraphic sections, planes

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of distribution, photographs, publications, etc.) in order to digitize it and perform a spatial and statistical analysis. To do this, we have created a database where we have included all the excavation data collected in paper until now. In addition, we have made the digital topography of the site and the territory in which it is located as well as the digital model of the terrain in 3D. All the data obtained has been integrated into a Spatial Data Infrastructure. All this has allowed us to make a digital reconstruction of the archaeological record of the site. We present here the preliminary results of these works that we have made with the authorization and the financial support of the autonomous government of the Junta de Comunidades de Castilla – La Mancha.

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Keywords: digitization, geodatabase, Spatial Data Infrastructure, spatial analysis, statistical analysis, virtual reconstruction, Middle Palaeolithic

From Surface Collection to Microwear Analysis: A Reappraisal of the History of Researches on Prehistoric Polished Stone Tools in Eastern India

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This paper is aimed at presenting an analysis of the published archaeological records in order to envisage the changing research trends carried out on prehistoric polished stone tools since their first discovery in Eastern India.

Polished stone tools are one of the prime components of prehistoric India, nay eastern India. Since their first discovery from Son river valley of Bihar by W. Theobald in 1862, numerous such tools have been reported from different locales of eastern Indian region. A comprehensive survey of the available published records reveals that with the contribution of different scholars and incorporation of different research methodologies, the perspective of studying such tools changed from time to time. In the initial era of their discoveries, focus was mainly on collection of fully finished artifacts which were mostly picked up by the locals or by unskilled layman. As a result, most of these early collections lacked reliable field data and in majority of the cases the proper find spots from where the tools were picked up remains unknown. The introduction of systematic archaeological investigations, by means of both explorations and excavations, changed the scenario and contributed largely to the formation of prehistoric map of eastern India which was scattered with a large number of polished stone tools bearing sites. These also focused fresh light on stratigraphic as well as chronological boundary of such tools. For instance, owing to their origin in the Neolithic cultural period they were frequently cited in archaeological literatures as ‘neoliths’ or ‘neolithic implements’. However, stratified evidences from the study area have shown that these tool types were found beyond Neolithic level and indicated their association with aceramic, ceramic non-metallic, metallic (both copper and iron) and even with early historic contexts. As far as application of advanced techniques in this context is concerned, the study area illustrates an upsetting position in contrast to the rest of the country. Although in other parts of India advanced studies of such tools are gaining their prominence, here such studies are limited mainly to radiocarbon dating of the tool bearing horizons and a single incident of microwear analysis.

Within the present scope of work, an attempt will be made to visualize this transition from random unscientific collection to application of various scientific methodologies through four different stages. These stages although to some extent represent chronological development,

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they essentially signify different methodologies and/or perceptions applied while studying these kind of tools.

Keywords: Eastern India, Prehistory, Polished stone tools, Neolithic, Surface collection, History of Research.

Integration of microscopy, geometric morphometrics and machine learning classification algorithm for the identification of hand preference from stone tools

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Hand preference is related to areas of the brain linked to several critical functions such as language. Therefore, identifying hand preference in fossil hominids allows describing hand preference evolution but is also essential to characterize the origin and development of complex cognitive capabilities during human evolution. Stone tools, used during all periods and found extensively in archaeological sites, are likely to bear information about the hand which held them during repetitive activities. They are therefore of prime interest to provide new data about hand preference during evolution. However, only few studies, mainly focused on stone tool production, have been carried out with this purpose. Here we propose to focus on a repetitive activity which is very likely to embed better the information concerning hand preference: tool use. We aim at establishing an experimental protocol and a reference collection to build a model allowing determining the hand holding the stone during use. Monitored experiment has been carried out and both classical use-wear analysis procedures and new quantitative method based on geometric morphometrics on used edges were performed. These techniques provided complementary information to select the best parameters to be used for hand preference inferences. Applying k-nearest neighbors algorithm, we were able to build a model with more than 76% accuracy in classifying stone tools used by right or left handed subjects. The method is still perfectible but already promising and the addition of new stone tools in the reference collection and of new parameters in the model is likely to increase the good classification rate.

Keywords: Microscopy, usewear, geometric morphometrics, k, NN, classification, hand preference

Interdisciplinary studies of the settlement micro-region in Ulów, Middle Roztocze (SE Poland) - problems, results and perspectives

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In 2014 the project entitled "Roztocze – the ancient *terra incognita*? (Settlement micro-region in the area of Ulów in Middle Roztocze in the prehistory and its background. Interdisciplinary studies)", financed with funds from the National Science Centre (Poland), was started. Before archaeological examination in Ulów started, it was generally believed that the area of Roztocze had been inconvenient for prehistoric settlement, the main reasons being the lack of surface waters, limited access to groundwater, and topography. Excavations, which have been continuing in the vicinity of Ulów for 15 years, indicate that a number of cultures settled this area, from the Paleolithic and Mesolithic to the 17th-18th century. The principal aim of the project was the reconstruction of prehistoric and historical settlement processes in this area. The character of the work required the usage of a few scientific methods: archeological (quantitative, qualitative and typological analysis of the gathered artifacts, with photographic records and drawings; archeological excavations and surface surveys; comparative analysis of archeological data; creating the mode of development of the prehistoric settlement and its background description); anthropological (basic anthropological analysis of human bones); archaeozoological (marking animal bones); botanical (analysis of macroplant remains, anthracological analysis, palynology); mineralogical and petrographic (macroscopic, microscopic and comparative analysis); geomorphological and geological (geomorphological-geological cartographing, geodetic cartographing, probing, modes of natural topography of the particular terrain); physico-chemical (physic-chemical analysis of deposits, radiocarbon dating of organic remains), geophysical, Information Technology (digitalization of archeological data, database in the graphic environmental operating system GIS) and analysis of LiDAR data. As a result of these works in Ulów it was possible to correct the theory on the settlement void in Middle Roztocze and to reconstruct the particularly favorable local conditions contributed to the formation of the settlement enclave surrounded by the vast areas devoid of settlements.

Keywords: interdisciplinary studies, settlement micro, region, reconstruction of prehistoric and historical settlement, Ulów, SE Poland

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L'adaptation de sociétés paléolithiques à leur environnement : de l'art de malmener les concepts et de poser les mauvaises questions ?

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Utilisé par plusieurs disciplines scientifiques qui l'ont reformulé en fonction de leur problématique centrale, le concept d'adaptation renvoie avant tout, en anthropologie et en géographie, à l'ajustement de l'homme à son milieu naturel et à son évolution. Au-delà d'une sémantique dont elle ne mesure pas toujours la complexité, l'archéologie préhistorique (préhistoriens et anthropologues biologistes) manie ce concept pour aborder certaines thématiques : évolution humaine (biologique et culturelle), grandes migrations durant le pléistocène et l'holocène, ou encore populations en milieu dit contraignant. Ainsi, il semble difficile de formuler les questions, en considérant les problèmes d'échelle temporelle, de causalité, de réactivité, de visibilité, et ce d'autant que le concept d'environnement-toujours très débattu, même au sein des anthropologues- est le plus souvent assimilé à celui de milieu naturel. De plus, la question de la relation société-milieu formulée comme adaptation aux changements du milieu naturel (via le climat) est rarement posée comme telle par les préhistoriens du Paléolithique supérieur, mais davantage par les anthropologues, majoritairement anglo-saxons, qui s'efforcent de corrélérer l'effondrement des sociétés aux changements climatiques. L'objectif de cette communication est d'exposer comment les préhistoriens européens qui étudient les sociétés des derniers grands froids secs du Paléolithique ont utilisé ce concept d'adaptation en le reliant à celui d'environnement, en évitant de poser la double question du contenu de cette adaptation et de la nature des informations recherchées, le tout dans une dialectique de domination de l'Homme sur la nature.

Keywords: Adaptation, Environnement, Epistémologie, Sociétés paléolithiques

*Speaker

Le travail du bois dans la Préhistoire: les chaînes opératoires de la fabrication d'artefacts meubles et immeubles.

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2

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Au long de la préhistoire le travail du bois a été une activité fréquente. Les indices de cette activité proviennent des restes archéologiques des rares objets en bois trouvés, mais aussi des types d'outils de chaque époque et des analyses des traces d'usure sur ceux-ci. La chaîne opératoire comprend des activités de sélection et d'acquisition de la matière première, mais aussi de transformation et finition des objets.

Dans cette étude on présente une révision bibliographique des données disponibles jusqu'à maintenant, accompagnée des réflexions sur les techniques de travail du bois en fonction des outils disponibles du Paléolithique Moyen jusqu'au Néolithique. Ce travail se soutient aussi sur une base expérimentale pour le dépeçage et la taille du bois, réalisée avec des outils en silex et en calcaire.

C'est pourquoi il est possible d'arriver à des conclusions à propos de la performance de chaque type d'outil, mais aussi des capacités techniques pour la transformation du milieu des groupes humains.

Keywords: Paléolithique, Néolithique, outils, traces d'usure, bois

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Les habitats désertés de la région d'Akoupé (Sud Côte d'Ivoire) : une opportunité pour la reconstitution des savoir-faire céramique en contexte forestier

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En Côte d'Ivoire la céramique est connue dans presque toutes les régions. Cependant, nous constatons que cette activité présente des traces éparses dans le sud précisément sur la Côte. En raison de l'insuffisance des recherches menées dans la région d'Akoupé, une étude s'avère nécessaire en vue de contribuer à la reconstitution de son passé et à la valorisation de son patrimoine culturel. C'est ce à quoi nous nous attelons depuis quelques années. L'objectif visé est de retracer l'histoire de la céramique à travers les sites abandonnés.

À travers les sites désertés répertoriés, nous donnons dans la présente communication un aperçu des types de céramiques. Nous sommes aidé en cela par les données de la tradition orale afin de mieux cerner l'histoire du peuplement.

Keywords: Potière, Céramique, Techniques, Sites désertés, Côte d'Ivoire

*Speaker

Méthode d'étude archéostratigraphique d'un site préhistorique. Mise en évidence des niveaux d'occupation de la grotte des Ramandils (Port-la-Nouvelle, Aude, France).

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Dans les gisements paléolithiques qui renferment de nombreux vestiges (ossements, outils lithiques, pierres, etc.), coordonnés spatialement lors des campagnes de fouilles, les différentes méthodes de décapage mises en œuvre ne révèlent pas toujours les véritables niveaux d'occupation. Lors de ces phases de décapage, des surfaces, considérées comme des occupations humaines sont révélées, sans qu'il y ait de véritable étude archéostratigraphique pour en vérifier les limites. La méthode d'individualisation des niveaux archéostratigraphiques s'inscrit dans une démarche interdisciplinaire, nécessitant aussi bien les coupes de terrains que les données paléontologiques et lithiques. Elle repose, d'une part, sur les données brutes de terrain consignées dans les carnets de fouilles, avec notamment les trois coordonnées (x, y et z) de chaque objet, et, d'autre part, sur l'exploitation d'une base de données, regroupant les différents niveaux d'analyse de ces objets qui sont alors projetés sur des plans verticaux, au moyen de logiciels comme Tauta3D ou Qgis. Les projections longitudinales et transversales sont croisées pour valider les zones de densités relatives des objets en intégrant les différents critères archéologiques et stratigraphiques.

Cette méthode a été appliquée au site moustérien des Ramandils (Port-la-Nouvelle, France), dont le remplissage, d'une puissance de 5 mètres, se compose d'une succession de dépôts continentaux surmontant le niveau marin tyrrhénien. Plus de 30 000 objets coordonnés sont issus des fouilles programmées, menées de 1983 à 1994 par Paul Boutié.

L'étude archéostratigraphique préliminaire a permis de mettre en évidence une vingtaine de niveaux archéologiques pour les cinq grands ensembles définis lors de la fouille. Les études menées en parallèle sur l'industrie, la grande faune, la malacofaune et les coprolithes devraient permettre de caractériser les niveaux d'occupation humaines et carnivores ainsi définis. Cette méthode est appliquée aux différents types de sites pour valider les protocoles, définir les limites et proposer une démarche d'apprentissage à très large spectre.

*Speaker

Keywords: niveau d'occupation, moustérien, archéostratigraphie, projection verticale

New methods for the structural conservation of the fossil substrate

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2

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The Paleontological Heritage is composed mainly of the paleontological deposits and the fossil records found in them. The fossil record is a fundamental indicator to discover the truth about the life of the past, so it is essential to favor the correct conservation of its original nature. To guarantee a correct preservation of the original identity of the fossil, it is necessary to establish the most suitable performance criteria. Before designing any conservation methodology, two essential factors must be studied; the size (macrofauna or microfauna) and the degree of mineralization of the fossils.

The structural conservation of a fossil depends on consolidation and adhesion methods. Therefore, when choosing the most suitable product to guarantee the correct preservation of the original nature of a fossil it is necessary a previous consideration of product qualities such as penetration capacity, adhesion power and its chemical compatibility, among others.

For this purpose, the efficacy and safety in the organic paleontological material of the consolidators Paraloid B-72® and Nanorestore® have been evaluated. In the first assay, the penetration capacity of the studied consolidators was examined, showing better results in Nanorestore®. In a second assay, new forms of application were proposed for these two products, in order to improve their performance. In the case of Paraloid B-72® a new format has been proposed, whose penetration capacity is limited and a better reversibility is favored, whereas the adhesive capacity of Nanorestore® has been enhanced when combined with Adper™ Single Adhesive Bond 2.

With the data obtained from these trials, it has been possible to differentiate two conservation methodologies, proposed for two different circumstances: field work (in situ) and laboratory study. In both methodologies, greater priority is given to the methods of adherence to the consolidation methods, due to their scarce interaction with the material to be treated, thus favoring greater respect for the original identity of the material to be conserved.

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Keywords: Conservation, Fossils, ADN, Consolidating and Adhesive.

Paleoparasitology

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Les analyses paléoparasitologiques ont été multipliées ces deux dernières décennies, au même titre que celles effectuées en génétique ou dans les disciplines paléoenvironnementales et ce non seulement dans l'idée de mieux cerner l'environnement mais aussi certains comportements humains imperceptibles via les données de la culture matérielle.

Alors même que le nombre de données commence à s'accumuler, Karl Reinard a fait paraître en Juillet 2017 un article s'intitulant " Reestablishing rigor in archaeological parasitology ". En effet, une partie des protocoles d'échantillonnages ainsi que l'observation en microscopie optique se sont avérés dans certains cas faux ou déconnectés des données de terrains.

Ces dernières années, des échantillonnages systématiques sur tous types de terrain nous ont permis de mettre en évidence des contextes sédimentaires propices à la conservation de ces propagules, différents parfois au sein d'un même site. Tous les œufs d'helminthes, qui sont le principal support utilisé en paléoparasitologie, n'ont pas exactement la même composition chimique et donc pas la même réaction aux différents processus taphonomiques. Ainsi les structures de combustion, qui sont particulièrement propices à la conservation des restes carpologiques, anthracologiques et même, parfois, osseux, s'avèrent complètement négatives à nos analyses. A ce jour aucune étude n'a été effectuée sur la résistance taphonomique des œufs d'helminthes, car ils sont considérés comme des NPP et à ce titre non pas fait l'objet de traitement en laboratoire pour mieux cerner leurs conditions de conservation, comme cela a notamment et de longue date été réalisé sur les pollens.

Plus qu'une collaboration étroite avec les différents spécialistes, se déplacer sur les gisements analysés permet une meilleure appréhension des substrats ainsi que des unités architecturales et stratigraphiques qui nous permet d'exécuter un échantillonnage rigoureux et pertinent, à travers les gisements d'El Portalón, Atapuerca (Espagne), Els Trocs (Espagne), La Lède-du-Gurp (France). Selon le contexte, un échantillonnage systématique en plan et/tout en stratigraphie nous permet d'être renseignée sur la répartition des dépôts détritiques ou sur l'apparition chronologique de certaines espèces. La qualité de l'échantillonnage de terrain est essentielle pour le travail à poursuivre en laboratoire.

Keywords: Paleoparasitology, methodes, échantillonnage, stratigraphie

*Speaker

Parietal art of Kapova cave: the difficulties in documenting the wall paintings in 1960-2010

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Kapova cave is situated in the Southern Urals (Russia). A.V. Ryumin discovered the Upper Paleolithic wall paintings in Kapova cave in 1959. The archaeological research in the cave was conducted by O.N. Bader (1960-1981) and V.E. Shchelinsky (1982-1991). In 2008 the Southern Urals archaeological expedition of the Lomonosov Moscow State University started to work at Kapova cave (Zhitenev et al., 2015).

Since the discovery of the paintings in Kapova Cave in 1959, and until now, there have been made several attempts to document them. At various times this kind of work was provided by archaeologists (O.N. Bader and V.E. Shchelinsky), and by enthusiasts - representatives of the natural sciences (A.V. Ryumin, Y.S. Lyakhnitsky, A.K. Solodeinikov). However, taking into account all the importance of the works, which have been already done in this field by the researchers, there is still no complete catalogue with all the necessary data. One of the main problems encountered by experts from the Southern Urals Archaeological Expedition of Lomonosov Moscow State University during the cataloguing of the wall paintings was the problem of the differences in measurements made by different authors. In the archival documents and published works it was not specified according to which principles and particular points of the paintings these measurements were made. The importance of this problem is determined by the need for clear measurement criteria for monitoring the state of the images.

There was made a comparison on the data on the size of the paintings obtained by the different researchers of Kapova cave and the difficulties, which were encountered by the researchers in the process of documenting the parietal art, were examined. The authors also offer a new approach to documenting the paintings of Kapova cave, based on the latest data on measurements obtained as a result of work in the Chamber of Chaos.

Keywords: parietal art, measurements, methods, Kapova cave, Upper Paleolithic, wall paintings, catalogue of paintings, documenting wall paintings, ochre

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Paths in the landscape: Rock art as a tool to track past information networks

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One of the main reasons why humans build social networks is the exchange of information. Information is a good as valuable (or even more valuable) than any material good. Information circulating by a set of social networks, working through time, generate, like water makes gullies in a landscape, a set of connected paths, what we have termed Cultural Transmission Archaeological Paths (CTAP see Caridi and Scheinsohn 2016). Information and materials circulate by those opened paths, offering lines of least resistance that leaves patterned material consequences. Those materials allow us to track a regional CTAP, a temporal flattened image of the social networks active in a certain area.

One of the best ways to track those regional's CTAP is through rock art.

Rock art was one of the most ancient visual communication channels that humans had. Archaeologists had been aware of the communicative role of rock art and its storing information capacity (cf. information storage model). Whallon (2011) argued that this information storage system functions only as long as the knowledge of how to retrieve that information is present in a social group. We think that Information Theory and networks allows us to treat its information content without having to consider its meaning. Given the accretional characteristics of rock art, what we have in a certain landscape is a differential pattern of motifs distribution which was accumulated through time. There are many time spans mixed up since, unless we have detailed radiocarbon dates or other way of chronological control, it is not possible to separate them. But Mutual Information, a measure of the mutual dependence between the two variables that quantifies the amount of information obtained about one random variable, through the other random variable, allow us to reconstruct those "fossilized" CTAPs by formalizing correlations between, in this case, the presence and absence of rock art motifs in archaeological sites and visualize them in a network defined by a set of nodes (rock art motifs) and a set of links (mutual information between them). We will exemplify this proposition by analyzing a set of rock art sites from NW Patagonia (Argentina).

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Keywords: Rock Art, Information, Networks

Quantitative approach to the study of Neolithic projectile point of South-Eastern Arabia: a new systematic description

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During the past two decades, the archaeological and theoretical concept of "Arabian Neolithic" has endured several revisions and different neolithisation models have been proposed. The abundant presence of arrowheads in lithic assemblages and the scarcity of stratified datable sites conferred these lithic implements a diagnostic value, especially in the Arabian Peninsula. However, several studies have risen doubts on the analytical validity of traditional arrowhead typologies. Here, a new systematic description is proposed based on the consistent observation of substantial change through time and space. Such observation is dependent on the identification of sets of independent, non-hierarchical, diagnostic characters that help to univocally describe each object, and to classify the observed materials without recurring to existing chronological types. This formal approach facilitates a quantitative exploration of change over time, and makes it possible to ascertain whether observable similarities between individual arrowheads (or groups of arrowheads) can be explained by the emergence of different lineages (inheritance) as opposed to historical continuity and functional convergence. This method has not been tested yet in this context of interest, and it promises to offer a valid tool for generating testable hypotheses on the neolithisation of southern Arabia by linking it to human population movement in in the Arabian Peninsula during the Early and Middle Holocene (10000-5700 BP).

Keywords: Arabia, Neolithic, quantitative methods, projectile points

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Tenir compte des imprécisions chronologiques dans les décomptes d'évènements archéologiques par pas de temps

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Construire des distributions chronologiques selon un pas de temps fixé par le chercheur (par siècle, décennie, etc.) pour compter les événements étudiés est une opération basique - c'est à dire fondamentale - dans une étude chronologique. Cette opération ne pose pas de problèmes avec des sources fiables d'une précision supérieure au pas de temps retenu. Mais ce n'est pas le cas en archéologie où les imprécisions de datation, et l'inégalité de ces imprécisions, compliquent l'élaboration de telles distributions. Le traitement explicite et formalisé de ces imprécisions permet d'éviter le double écueil du renoncement face à des données trop "molles" et du bricolage incontrôlé en vue d'obtenir coûte que coûte une courbe d'évolution. La communication présentera un outil simple, libre et gratuit (application Chronophage, intégrée au logiciel libre LibreOffice) permettant de construire plus solidement ces distributions chronologiques en traitant les imprécisions à l'aide d'approches de nature probabiliste ou inspirée de logique floue, et suivant que les événements imprécisément situés sont réductibles à des instants sans durée, ou munis d'une durée elle-même plus ou moins précisément connue. Des cas d'application seront présentés concernant la Protohistoire mais aussi la période médiévale.

Keywords: distribution chronologique, traitement des imprécisions

*Speaker

Theoretical approaches to the evolution of emotional cognition: Can the archaeological record help us to understand how human altruism evolved?

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Pro-social and altruistic motivations have played a key role in human collaboration and ultimately human evolutionary success. There are however different explanations for how such motivations may have emerged, from the selective pressures of collaborative parenting, to inter-group competition, risk pooling or costly signalling. Different types of pro-sociality are likely to have led to different behavioural records however. Here we evaluate the benefits of pro-sociality to individuals and communities at different stages of the palaeolithic, and review how the archaeological record can contribute to understanding how emotional motivations to help others evolved.

Keywords: palaeolithic, evolution, cognition, emotion, altruism

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