United Kingdom Computer Applications & Quantitative Methods in Archaeology

CAA-UK 2017

Through The Looking Glass

Winchester, Ashburton Hall
4th and 5th March 2017

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United Kingdom Computer Applications & Quantitative Methods in Archaeology

Timetable

4th March

11.00	S. Stead	Keynote paper - Angry Young Man: 30 Years Later. Still ANGRY?
11.30	E. Kotoula	HER-Ob (Cultural HERitage-Object): An open source platform for shared analysis in cultural heritage research
12.00	G. Hunt	Tools for 21st Century Archaeology
12.30	Lunch/Posters	
14.00	O. Aldbiyat	The contribution of the 3D modelling in the ethno-archaeological studies. The case-study of the village of Qdeir in Syria.
14.30	G. Cox	The Invincible Web Tour
15.00	J. Miles	The Potential of Structural Analysis in Archaeological Simulation and Interpretation: A Case Study of Medieval Winchester Cathedral Close
15.30	Coffee	
16.00	F. Rodríguez del Cueto	Using 3D photogrammetry in a megalithic tomb of Northwestern Iberia: first results in the Campa San Juan Dolmen. Salas, Asturias (Spain)
16.30	E. Kartaki	The use of computed tomography for creating virtual archives of conservation condition reports: The case study of a 17th century casket
17.00	H. Pagi	The Rode Altar in Close-Up
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5th March

9.30	P. Cripps	Moving towards a Linked Geospatial Data ecosystem for heritage research
10.00	I. Kramer	A future perspective on automation in remote sensing
10.30	P. McKeague	Recent developments in spatial information access at Historic Environment Scotland
11.00	Coffee	
11.30	S. Maddeson	The Spatial Distribution of Iron Age Hillforts in the British Isles
12.00	P. Cuthbertson	Occupying Central Asia: Using Accessibility to Assess Lower-Middle Pleistocene Dispersal Models
12.30	G. Dean	Intra and Intersite analysis, GIS and the Medieval City
13.00	Lunch	
14.00	D. Mateo	Quantifying pots: Statistical correctors applied to quantitative ceramic analysis
14.30	C. Drost & M. Vander Linden	Contrasting the influence of environmental feedback and the nature of demographic spread in shaping the early-mid Neolithic: and agent based modelling approach
15.00	P. Reilly	Keynote paper - Unstable Futures/Potential Pasts: pulling together archaeology in a digital age
15.30	Coffee	
16.00	AGM	
16.30	AGM	
17.00	AGM	

United Kingdom Computer Applications & Quantitative Methods in Archaeology

CAA-UK

CAA is an international organisation bringing together archaeologists, mathematicians and computer scientists. Its aims are to encourage communication between these disciplines, to provide a survey of present work in the field and to stimulate discussion and future progress.

CAA-UK exists to advance the aims and interests of CAA in the UK, and to provide a focus for those who may be unable, for whatever reason, to attend the international conference. A local chapter meeting is held annually (except in years when the international meeting is in the UK).

Committee members

Elected Members

- James Miles (Chair)
- John Pouncett (Secretary)
- Andreas Duering (Treasurer)

Trustee

- Stephen Stead

Our constitution can be found online

http://uk.caa-international.org/constitution/

4th March

11am – Keynote paper - Angry Young Man: 30 Years Later. Still ANGRY?

S. Stead

At CAA87 in Leicester I spoke about a flexible excavation recording methodology and the software environment to support it. It was flexible in the field but well documented and pretty explicit as to what everything meant. Mike Rains continued the development of this architectural outline to produce the Integrated Archaeological Data Base (IADB) that we know today. Now 30 years later I am known for my endless droning about the CIDOC Conceptual Reference Model (CRM) (ISO21127) and the benefits it brings. The $CRM_{archaeo}$ and CRM_{BA} (Archaeological Buildings) extensions are nearing completion so what am I still angry about?

1. Data meaning is still not explicit and certainly not explicit enough to be machine processable!
2. The universal confusion of format with reusability (think XML, RDF(S) and LOD)
3. No recognition of the tension between novelty and reuse
4. Data honesty is still considered risky and scary and time/resource consuming. Face it your data is NEVER going to be perfect.
5. The waste of talent. So many early career female scholars are being put off by the disciplines behaviour. Conferences like ours need to make it easier to attend for parents.

11.30am - HER-Ob (Cultural HERitage-Object): An open source platform for shared analysis in cultural heritage research

E. Kotoula, K.G. Akoglu, S. Weiqi, Y. Yang, Z. Wang, S. Simon, and H. Rushmeier

Although the use of digital techniques is becoming a standard for archaeological research, specific software that meet the needs of cultural heritage professionals is still at an early stage of development. Systems that provide holistic approaches to data interpretation, easy retrieval of information, tracking of the development of projects and sharing of their results are prerequisites for the success of multidisciplinary cultural heritage research project.

CHER-Ob (CulturalHERitage-Object), a new open source integrated platform for cultural heritage research, developed by Yale Institute for Preservation of Cultural Heritage and Yale Computer Graphics Group, encourages cooperative research and enhances the interaction between cultural heritage professionals and digital technologies. It meets documentation, data management and analysis, collaboration and sharing needs. It proposes a new methodology for managing 3D and 2D visualizations as well as textual and conservation science data, analysis and evaluation, documentation and sharing of information.

In this presentation, commonly used systems will be briefly discussed and the conceptual design of CHER-Ob will be explained. The main features of the new software will be highlighted; its compatibility with commonly used imaging data types (2D and 3D images, Reflectance Transformation Images, Computed Tomography) and textual information and its main features, such as the different annotation modes, the automatic report generation, the metadata schema, the bookmark, screenshot, searching, sorting and filtering options. The following case studies, highlighting the potential of the new software, will be presented; 1. decision making for 3D printed

QR coded cuneiform tablets, 2. condition monitoring for stone outdoor sculptures and tombstones; 3. integration of diverse datasets from historic cemeteries, 4. comparative RTI analysis for rock-art.

12pm - Tools for 21st Century Archaeology

G. Hunt

Archaeologists in many fields have embraced the use of technology, from simple websites and social media for public engagement through to complex virtual reality models. Where commercial IT industry developments intersect with research and funding imperatives the results are often spectacular but unfortunately the pace of development in commercial IT means that specialist archaeological tools are often left high and dry by updates and upgrades.

Glancing around many excavations or academic offices you would also be forgiven for concluding that archaeologists as a group are completely uninterested in technology and are much happier with pen and paper. The reluctance of some archaeologists to adopt technology coupled with the need to direct efforts to where funding will be forthcoming means that there is a distinct 'gap' in provision of useful tools to support archaeologists in their day to day work

2pm - The contribution of the 3D modelling in the ethno-archaeological studies. The case-study of the village of Qdeir in Syria.

O. Aldbiyat

In Near East, the knowledge of the domestic architecture from the Bronze age, depends mainly upon the archaeological data. However, the archaeological remains show always uncovering and incomplete buildings. Indeed, we find walls of a few centimetres, sometimes one metre and very rarely of two metres. Therefore, the using of the ethnographical studies of villages of our current life is fundamental to fill in the gap. Moreover, the ethnoarchaeological approach helps us to better understand several issues such as the type of architecture like the materials used for the construction, the way of distribution of the residential places etc. The main challenge of this topic is to understand as well how people plan to build their residence.

3D modelling contributes as well to support this approach. In fact, it allows us to study in details and present separately the different architectural elements of the houses. 3D modelling highlights as well the problematics regarding the different phases of construction. For instance, in my PhD, I am developing a method of analysis focused on recent traditional technics of architecture in Syria, such as the semi-nomadic village of Qdeir, mostly built with stones and mud and located about ten kilometres northwest from El Kowm, to sketch a 3D modelling used for the archaeological domestic architecture research.

This paper aims to put into perspective the questions of the 3D and visualisation modelling of the domestic architecture throughout the example of Qdeir and demonstrate to what extent it can be applied to archaeological reconstruction. Several examples of houses give us information of the thoughts in design and how people use to live. It illustrates also the "architecture habits" of semi-nomads living in this region and using similar materials than Ancient periods. Finally, we will demonstrate how 3D modelling plays a role for the understanding of the process of settlement of the nomads.

2.30pm – The Invincible Web Tour

G. Cox, R. Ortiz, D. Pascoe

The frequency of photogrammetry in the heritage industry has seen a boom in 3D model creation in recent years, and in many areas of archaeology, these processes are already well established for artefact capture. The development of virtual environments, immersive technologies & HTML5 are also providing a range of possibilities for presenting online data, with existing established 3D pipeline packages facilitating visualisation with sophisticated physically based shaders, plugins, renderers and technical editing tools. Yet with all this available, are these tools being used to their fullest potential for site based study?

A side effect of capturing data in the field is that it becomes progressively more complicated as layered variables are introduced, creating a vicious circle where the archaeology most in need of coverage is also frequently the trickiest to document and therefore the least likely to have good quality coverage. A prominent example of this can be seen in low visibility maritime environments, where diving time, visibility, shifting tides and constantly changing conditions do not allow for archaeologists to exert a great deal of control. In tackling this issue, the Invincible team have created both physical and digital workflows to produce Photogrammetric models from within highly challenging conditions. Once formed, multiple high density 3D objects were combined in a singular CGI model, with the representation of features such as environment, visibility and seabed flora. This was then output into large 56 Megapixel images, supplemented with high definition animation and wrapped in a universally accessible, custom HTML5 web tour system.

This talk will explore the many challenges faced by the team throughout the project, especially in relation to the initial data capture and its translation into the digital elements of the project.

3pm - The Potential of Structural Analysis in Archaeological Simulation and Interpretation: A Case Study of Medieval Winchester Cathedral Close

J. Miles

This multidisciplinary research provides a unique integration of structural analysis and archaeological interpretation, focused on the implications of methods used to generate input data and the analytical frameworks within which new interpretations emerge. The main aims of the paper will be to explore the benefits of using structural analysis in archaeological contexts; to investigate how structural analysis can influence the way archaeological graphical simulations are produced; and to study the changes in structural properties of different forms of architectural styles.

Structural analysis is widely used to determine static, dynamic, and thermal behaviour of physical systems and their components. Several methods can be employed to analyse building and non-building structures. The main purpose of structural analysis is to ensure the adequacy of the design from the view point of safety and serviceability of the structure and to check stability in existing systems. Although the method plays an important role within many different disciplines, it has rarely been applied within archaeology. Therefore the paper will focus on the application of structural analysis within archaeology, specifically through archaeological interpretation and archaeological modelling of historic buildings and novel integration of voxel and surface techniques.

4pm - Using 3D photogrammetry in a megalithic tomb of Northwestern Iberia: first results in the Campa San Juan Dolmen. Salas, Asturias (Spain)

F. Rodríguez del Cueto, M. Busto Zapico, M. A. de Blas Cortina

This paper reports on a project of digitizing the structures recovered during the summer of 2016 in the Campa San Juan Dolmen, Salas (Asturias). This project aims to study one of the most significant samples of megalithism in Asturias. The megalithism was developed in our region between Neolithic and the first part of the Chalcolithic times. Indeed, several phases were identified in our excavation. For dating all these phases we will use radiocarbon dates (in progress), making connections with the information provided by the stratigraphy and the finds recovered. New (and more extensive) excavations will be developed in 2017 for a better understanding of the monument, funded by the Valdes-Salas Foundation in collaboration with the Prehistory Area (University of Oviedo).

The excavated area has around 15 square meters and during excavation, we used the classical records in archaeology to gather all the information: stratigraphic records, a wide photographic report, a topographic survey as well as field drawings. Besides, along with these tools, a specific group of photos was taken at key moments to do a 3D photogrammetry during the lab work. With the same aim in mind, two drones recovered another set of photos at the end of the excavation to carry out a 3D photogrammetry of the tumulus (in progress).

Despite the fact there are good studies published for other megalithic tombs of Iberia, such as Menga, Panoria or Viera, the results here presented based on the photogrammetry developed during the fieldworks of 2016 set a precedent in the archaeology of our region. Our proposal aims to get several 3D models of each part of the excavated area for purposes of interpretation and research. Besides, these first models will allow us to develop specific protocols with the goal of a more efficient and accuracy photographic record during further works. Finally, next year these models will be used to share our results and to encourage free visits to the archaeological area between neighbours and tourists.

4.30 pm - The use of computed tomography for creating virtual archives of conservation condition reports: The case study of a 17th century casket

E. Kartaki

The condition report of artefacts is an important part of the conservation treatment process. A condition report includes information about the condition of an artefact before, during and after conservation treatments and it works as a basic tool for any decisions made about future treatment. The report usually includes written descriptions and visual references. Traditional visual references include photographs (in visible, infra-red and ultraviolet spectrums) and illustrations (such as pencil drawings). Nowadays, digital technology provides more advanced methods, and researchers are using 3D models to illustrate cultural heritage artefacts in a continuation of traditional methods. The models are used not only to support the condition reports but also act as examination tools, without the need for physical access, and simulations of restoration scenarios.

According to many researchers the most accurate method to produce 3D models of the internal part of an artefact is Computed Tomography. This paper aims to apply and evaluate the method of Computed Tomography in order for it to be used for condition reports, based on the resulting visualizations and the time spent for the completion of the model. In order to accomplish this aim 3D

data capturing have been applied on a 17th century casket from Anne of Cleves House Museum in Lewes, UK. The casket was considered appropriate for this study because it consists of five different materials; wood, alabaster, with painted surface locally, paper and metallic elements.

As showed by this research, Computed Tomography recorded the external and internal structure of the casket, providing results of the materials used, the internal and external condition of them, and it helped to recognise secret construction components.

5pm - The Rode Altar in Close-Up

H. Pagi, A. UUeni, and J. Miles

The Art Museum of Estonia Niguliste Museum's project "The Rode Altar in Close-Up" focuses on the conservation and technical analyses of altarpiece of the high altar of Tallinn's St. Nicholas' Church (1478–1481), completed in the Lübeck workshop of the master Hermen Rode. The involvement of imaging and information technological analyses and material examinations, the thorough documentation of the work, and the mapping of the information are important in this project. A great deal of attention has been directed to involving the public through educational programmes, workshops and multimedia programmes reflecting the results of the research conducted (website, blog, interactive multimedia programme, scienceweb, etc.). Visitors can find out about the conservation and research work being conducted on site at the Niguliste Museum, where a studio has been set up, together with an exhibition that will expand over time. Archaeovision and Archaeovision R&D have been involved in the project from the very beginning. Our main tasks have been related to the imaging and production of web outputs for the high resolution multispectral images. The project has been partly funded by Estonian Ministry of Culture and Europeana Space project and supported by Archaeological Computing Research Group at University of Southampton

5th March

9.30am - Moving towards a Linked Geospatial Data ecosystem for heritage research

P. Cripps

A challenge for digital heritage research continues to be integration of digital information resources. Data continues to be generated and held in disparate silos using a variety of schemas, structures and systems. Even where standards such as MIDAS are used, the way in which content is created, managed, archived and disseminated precludes meaningful cross searching of information from different sources.

Online publication has done little to improve the situation resulting in a proliferation of portals for local, national and thematic resources. In particular, archives are often only available online as downloadable csv files of variable quality. Where geospatial resources exist, these typically include only a small subset of available information, delivered using archaic, defunct and restrictive file formats with the bulk of the information only available within html webpages or pdf documents. As such, geospatial information is particularly poorly catered for. Yet tools, platforms and standards exist which could be used to improve access to our shared digital heritage information resources, moving beyond unhelpful downloads and simple online viewers.

In the same way as the web is moving away from unstructured text in html pages towards a web of data, the same is happening with geospatial information. The GSTAR project (Geosemantic Technologies for Archaeological Research) built on such developments, leveraging Linked Data and Semantic Web technologies to investigate some of the heritage issues described above. Ontology based processing pipelines facilitated the publication of Linked Geospatial Data from heterogeneous sources including HERs, museum collections and fieldwork archives. Demonstrator applications were developed to provide a geospatial portal capable of advanced querying across resources with geosemantic capabilities. The portal application was driven by web services and a comprehensive API, demonstrating how such systems can provide access to a range of clients including not only web mapping applications but OGC standards compliant desktop GIS applications. As such, the outputs from GSTAR show how virtual research environments can be built using published, open standards for a broad range of online and offline heritage research use cases, based around Linked Geospatial Data published from a wide range of sources.

10am - A future perspective on automation in remote sensing

I. Kramer

In the UK there is a longstanding tradition for the use of remote sensing to detect archaeological sites. As research in the UK has been mostly pioneering in the field it is surprising that the upcoming automation practises have not been adopted in research nor practise. Automation has been mostly criticised for the lack in accuracy but recent successes in computer science could overturn this. The key factor for this change is deep learning which has already been overwhelmingly successful in other domains such as self-driving cars and medical imagery. This paper will present how the archaeological field could benefit from these techniques in especially large mapping projects.

Examples will be drawn from the ImageLearn project developed by the Ordnance Survey (OS) and the Electronics and Computer Science Department at the University of Southampton. In this project the high resolution aerial imagery and extensive set of labelled data from the OS was successfully used to automatically generate land cover classification. For the next phase of this project archaeological object detection will be studied as it provides a unique opportunity to test this model on some of most 'overwritten' signatures within our landscape.

10.30am - Recent developments in spatial information access at Historic Environment Scotland

P. McKeague

Canmore provides free online access to information from the National Record of the Historic Environment. Originally a simple text search, a map interface, showing the site locations against modern Ordnance Survey mapping was added in 2003. In 2016, a redevelopment of the map interface, using Open Layers 3.0 technology, introduced significant enhancements. Users may now view records against a range of current and historic background mapping served up as Web Map Services from multiple external providers. The Open layers 3.0 software effortlessly manages projections, transforming datasets published as WGS84 to the British National Grid (OSGB 36) so that county series historic OS mapping may be overlaid on the current OS mapping or even OpenStreetMap. Against these background maps users may also view additional spatial data, including data from our airborne mapping layer, known site extent polygons and pilot data from our Urban Characterisation programme.

Publication of additional spatial layers with Canmore highlights the need for consistent data standards that can be applied to a range of datasets created both within and outside HES. For instance the airborne mapping layer uses a simple legend devised for the mapping programme in the 1990s. Work is now ongoing to redefine the legend referencing the Class Group terms published through the INSPIRE Registry National Monuments Record designations and the top concepts of the FISH monument types thesaurus with the ultimate aim of applying the approach to external datasets.

A national mapping convention is essential for presenting data within our own portals (Canmore and PastMap) but increasingly for serving up a consistent data set to third party websites such as SEWeb or Marine Scotland's National Marine Planning Interactive portal. WMS and WFS are also discoverable through the Scottish Spatial Data Infrastructure, data.gov.uk and, for designation datasets, directly from the HES Heritage portal. Users can add these services into remote terminals enabling the data to be used directly alongside their own project work.

11.30am - The Spatial Distribution of Iron Age Hillforts in the British Isles

S. Maddison

Although amongst the most iconic and clearly visible of prehistoric remains in Britain, Hillforts are generally poorly investigated and understood. There are some 3500 known sites on the British mainland, and a joint project out of Oxford and Edinburgh is now well advanced in creating a definitive 'Atlas of Iron Age Hillforts in Britain and Ireland' , a valuable resource for future research.

This database has been used to establish hypotheses relating to the spatial distribution of Hillforts, using modern spatial analysis and Geographical Information Systems (GIS) methods and tools. This work was carried out for a Masters dissertation at UCL.

Initial analysis for the whole of the British Isles has focused on identifying 'natural' groupings of Hillforts using an established technique called Percolation Analysis (e.g. Stauffer, D. and Aharony, A. 1991), based purely on the Euclidean distance between them; this technique has also been applied in geography (e.g. Arcaute, E., Molinero, C., Hatna, E. et al. 2016). This has produced some very interesting results showing clusters for different distance thresholds that have distinctly regional characteristics in the UK mainland and a quite different one for Ireland.

Further analysis continues with the identification of possible territorial and hierarchical relationships between Hillforts within four selected clusters, based on the sites' enclosed area, and these are explored for possible explanations. Spatial comparisons are also applied with other classes of data. In particular the use of data gathered on Iron Age finds in England as part of the Portable Antiquities Scheme shows that there was a lot going on in Iron Age Britain that was most certainly not restricted to the 'Hillfort Zone', supporting arguments by Bradley (2007) for example.

Percolation Analysis is not a magic tool to elicit the past, but it does show great promise in generating the starting point for more detailed work, drawing on further details within the dataset and incorporating other sources of data.

This paper will present and discuss these initial results and the potential for further research.

Arcaute, E., Molinero, C., Hatna, E., Murcio, R., Vargas-Ruiz, C., et al. (2016) Cities and regions in Britain through hierarchical percolation. *Royal Society Open Science,* 3.

An Atlas of Hillforts in Britain and Ireland, http://www.arch.ox.ac.uk/hillforts-atlas.html, Accessed: 12/1/2014

Bradley, R. (2007) *The Prehistory of Britain and Ireland,* Cambridge, Cambridge University Press.

Stauffer, D. & Aharony, A. (1991) *Introduction to Percolation Theory,* Boca Raton, USA, CRC Press.

12pm - Occupying Central Asia: Using Accessibility to Assess Lower-Middle Pleistocene Dispersal Models

P. Cuthbertson

The Central Asian record contains very few well-dated Lower-Middle Pleistocene sites, and the vast majority of sites that have been identified as Lower Palaeolithic have been found as surface scatters. This is compounded by the fact that the oldest site in Central Asia, at Kul'dara (Tajikistan), does not exceed 1 million years in age. This represents something of an anomaly in the Asian Palaeolithic record, as Central Asia lies on roughly the same latitude between the site of Dmanisi (Georgia) in the west, which has been dated to around 1.88 million years ago, and the Nihewan Basin (China) in the east, where the oldest occupation is around 1.66 million years ago. The lack of completeness in the Lower-Middle Pleistocene record, intensified by confusion over the interpretation of the different technologies that have been designated as Lower Palaeolithic, has led to the region mostly assuming

a minor role in broad-scale narratives of hominin dispersal through Asia. The current study is focused on using an accessibility analysis to assess the likely areas of entry and movement through the study region during the Early-Middle Pleistocene. This analysis uses a variety of environmental and geological datasets and proxy datasets to construct a composite predicted resource distribution. This reconstruction takes account of a variety of factors including possible raw material outcrops, groundwater potential, and the reconstructed palaeohydrology of the Caspian and Aral seas Furthermore, this approach is developed from the perspective of landscape affordances. Results from this analysis have already begun to shed light on the distribution of raw materials at the wider scale of the study region, and their connection to the broad technological distinctions identified by other researchers. These new results from the accessibility phase of the project will be used to assess some of the broad-scale dispersal narratives currently proposed by other researchers, and to promote a perspective of Asian Pleistocene dispersal that makes the most of an often neglected Central Asian record. It is also hoped that this study could provide a scaffold for further research in the region.

12.30pm - Intra and Intersite analysis, GIS and the Medieval City

G. Dean

The use of GIS for the analysis for deeply stratified archaeological information, not just from recent work but also the wealth of unpublished material from the last 40 years, remains largely unexplored. In other disciplines, notably historical geography, the study of medieval towns has benefitted in recent years from the use of GIS; although this has tended to focus on medieval urban form. Even within archaeology, GIS in cities has tended to focus on phases of the buildings, chronological evolution and spatial distributions of artefacts for understanding formation process and changes over time. More broadly, the study of medieval urbanism has begun to recognise that ideas of agency, social interactions and religious symbology often associated with intra and intersite analysis of the rural landscape are applicable to towns. This paper will develop these ideas to explore how GIS can be used as a means to explore the character and web of daily contacts within a city, moving beyond formation processes and mapping urban form. Drawing on work carried out in York, this paper will show that through the use of GIS for the integration of published and unpublished archaeological data in conjunction with historical and cartographic data, new digital mappings can be created for medieval cities that provide more nuanced understandings of urban development and the social uses of urban space.

2pm - Quantifying pots: Statistical correctors applied to quantitative ceramic analysis

D. Mateo

During the archaeological work, ceramic objects rarely appear in their complete form. For this reason, during the last decades a high number of quantitative methods have been presented, although there is still no consensus among the scientific community on which one is the best. In any case, the characteristics of the material and the research aims are two important factors to take into account, as the method chosen will affect the research results and interpretations.

Recently, we have proposed a quantitative method which includes the correction through a statistical coefficient named Modulus of Rupture (MR) (Mateo-Molina 2016). The aim of this method is to offer a fast and statistically reliable analysis, especially regarding the study of large volumes of material. In this paper, the first results of its application in amphorae are evaluated. Besides, in the

case of transport vessels like amphorae, it is highly interesting to analyse the proportions of the contents transported rather than the container itself. Towards that end, a project has been developed to obtain the average capacity of the most part of amphora types, through the generation of 3d models of complete amphorae scale drawings, adding an estimation of its statistical reliability.

Mateo Corredor, D., and Molina Vidal, J. (2016) Archaeological Quantification of Pottery: The Rims Count Adjusted using the Modulus of Rupture (MR). Archaeometry, 58: 333-346. doi: 10.1111/arcm.12171

2.30pm - Contrasting the influence of environmental feedback and the nature of demographic spread in shaping the early-mid Neolithic: and agent based modelling approach

C. Drost and M. Vander Linden

The development of early farming (i.e. agriculture and stock-breeding) is arguably a fundamental technological revolution. In the European case, both plant and animal domesticates were introduced from an external centre of domestication located in the Near East, so that we are dealing with a process of technological diffusion and adaptation (rather than de novo innovation). As evidenced by an impressive quantity of archaeological data, the spread of agriculture and stock-breeding across Europe is a long and uneven spatio-temporal process which lasted over three thousand years and, without much surprise, was paralleled by a variety of archaeological assemblages.

As part of an ongoing ERC-funded project (EUROFARM; PI: Dr M. Vander Linden), we are developing agent based computational models, based upon Axelrod's seminal paper on the dissemination of culture (Axelrod 1997). In this model, each actor is placed on a fixed location on a grid. Each actor possesses several features (e.g. 1, 2, 3 and 4), each of which being characterised by a given trait out of several possibilities (e.g. a, b, c or d). At each step, neighbouring agents can interact together, with a higher proportion of shared traits leading to a higher probability of exchanging traits for other features. Although this model is by definition extremely simple, we consider that it provides a robust proxy for archaeological assemblages, where each feature corresponds to a category of evidence (e.g. pottery, lithics) and each trait to the corresponding variability (e.g. pottery type). Building upon its simple elegance, we have introduced new rules in the model in order to explore the role of other factors upon the dissemination of traits.

These new rules concern both the physical geography within which the model is framed – mountains that block interaction, or seas that aid it – the mode by which features are able to spread, and the adaptive linkage between environment and specific traits. In doing so we aim to examine the relative importance of environmental adaptation and the demographic spread of the early neolithic, in determining the spatial distribution of both adaptive (e.g.: farming and stock rearing practice) and non-adaptive (e.g.: ceramic style) features.

3pm – Keynote paper - Unstable Futures/Potential Pasts: pulling together archaeology in a digital age

P. Reilly

In an increasingly connected digital world, large chunks of archaeology and archaeological practice seem to have become disconnected from one another. One disciplinary grand challenge we already face is the explosion of grey literature and grey data, and knowing when we know something new.

Digital tools are now ubiquitous and seep uncontrolled into the discipline, enabling many more methods and stakeholder communities to actively engage with and co-produce digital heritage. While pluralism may make archaeology more relevant to a greater variety and number of parties, this proliferation of technology-adoption if left uncoordinated could lead to a fragmentation of approaches, and the dissipation of resources and findings, ultimately undermining the discipline. How might we go about embracing and harnessing the latent power of these new consumers and producers of digitally propagated archaeology?

The approach advocated here is to anticipate and prepare for multiple potential scenarios and hopefully produce a fuller view on what might come to be rather than rely solely on forecasts regarding the likely impact of any particular technology. Our aim is to direct attention to plausible future contexts in which digital technologies are likely to be introduced into archaeology. Although scenarios are not predictive, they do however afford us the facility to defy the conventional flow of time which progresses linearly from the past through the present to some potential future. In scenarios, time flows can be multi-directional and iterative to reflect and refract plausible, possible, anticipated and probable futures.

The advantage of such an approach is that it allows us to learn from and discuss plausible digital futures of our digital past and how might we prepare for them, to make the discipline more agile responding to changes that must inevitably come. No definitive answer can be offered. My ambition here is to help frame a discussion concerning what an agile archaeologists should look like in the digital age.

4-5pm AGM

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