

Abstract Booklet

CAA UK: Edinburgh
26th and 27th October 2018

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

Please note, abstracts are listed in the order in which they are scheduled to appear at the conference.

Friday 26th October – Main Hall

Keynote- Visualising urban heritage: Dundee's lost spaces re-imagined

Alice Watterson, Kieran Baxter

In an urban environment, traces of lost built heritage lie among familiar streets and cityscapes. Telling the stories of an ever changing urban fabric while remaining connected to the current day places poses exciting challenges and opportunities for digital visualisation. Dr Alice Watterson and Dr Kieran Baxter report on their experiences of using creative practice to tackle these challenges while developing public outreach visualisations of Dundee's built heritage. Taking a flexible approach that combines digital modelling with methods from visual effects and animation, they respond to three radically different sites within the city limits. An Iron Age hillfort that once overlooked the now urbanised landscape of the Tay Estuary, the 19th century Dundee to Newtyle Railway, and the Royal Arch that once stood at the city docks are visualised using short film and augmented reality formats. Through these examples, the relationship between creative practice and visualisation technology, and the role that these can play in heritage interpretation, will be explored.

The Antonine Wall in the Digital Age

Patricia Weeks, Lyn Wilson, Al Rawlinson, Erik Dobat, Carsten Hermann

The Antonine Wall was the most northerly frontier of the Roman Empire, stretching across central Scotland. Today it is part of the serial transnational Frontiers of the Roman Empire World Heritage Site. On the ground, the remaining archaeology is often not much more than faint traces of earthworks. There is however a rich assemblage of artefacts excavated from Roman sites along the Wall. A principle challenge for the Antonine Wall is in presenting a coherent interpretation framework of sites spread across Scotland and artefacts housed in separate museum collections.

To improve interpretation and accessibility, we are collaboratively undertaking digital heritage initiatives based on digital documentation of archaeological sites and artefacts. This has included aerial LiDAR, terrestrial laser scanning, structured light scanning, photogrammetry and motion capture technology. The culmination of the digital documentation programme is the delivery and implementation of archaeogaming, virtual reconstructions, VR experiences and an app.

We recently launched the Go Roman game which allows people of all ages to interactively experience life in a Roman fort as either a slave girl or a Roman archer. This game-based learning approach features a number of real-life focussed quests to complete against the clock.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

An interactive app (Advanced Limes – ALApp) is also being developed which incorporates location-based augmented reality to digitally repatriate artefacts to their excavation spots. It transports visitors back in time through virtually reconstructed fort and ancillary buildings, based on accurate 3D imaging data and archaeological evidence. Through our European collaboration, the app will also include 3D data and information on the Roman frontier in Bavaria. It will allow virtual visits from anywhere in the world, helping to reinforce the transnational nature of this World Heritage Site.

Both the Advanced Limes app and Go Roman game are available as free downloads through the iOS and Google Play stores.

The use of digital technologies is ideally suited to the challenges posed by the Antonine Wall. This paper will examine these, along with those challenges faced in creation of the digital platforms and discuss the potential of digital technologies to make a positive impact for cultural heritage interpretation, understanding and accessibility.

Analysing the use of light and space in Neolithic Malta through the use of custom Unity3D scripting.

Robert Peter Barratt

Gaming software can offer many advantages to archaeologists. Game engines like Unity3D provide simple structures and interfaces that can enhance archaeological analysis, often combined with scripting software that allows for the creation of custom built investigative tools. The flexibility of Unity3D is ideal to simulate virtual environments and answer specific research questions. However, the application of gaming software in archaeology is fairly recent, and more work has to be done in assessing the advantages and risks of this methodology.

The focus of this paper is to present examples of gaming software analysis carried out at sites in the Neolithic Maltese landscape. The Ggantija temples and the Xaghra Brochtorff Circle funerary complex are reconstructed in Google Sketchup and imported into Unity3D. Solar alignment at Ggantija is tested using a custom script that calculates solar position throughout the year, demonstrating an intentional positioning of the temples to align with the winter solstice. At the Brochtorff Circle, a tailor-made viewshed script simulates the use of megalithic screens to control sight and lighting within the cave system. These results highlight the similarities between hypogea and temples, providing further insight into the use of light and space in Maltese ritual.

The Maltese examples also show the potential of using game engines in archaeological analysis. The ability to customise software to answer specific questions, and the possibility to explore virtual reconstructed environments are amongst the benefits. On the other hand, issues with inaccuracies and inaccessibility of resources can cause problems for the dissemination of research.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

The conservation and management of Historic vessels and the utilisation of 3D data for information modelling

Dan Atkinson

The increased use of laser scanning and photogrammetry has given rise to new opportunities in disseminating information about historic maritime assets and are of great use in conservation management initiatives. This paper will present the current state of 3D survey of historic vessels and how this has been utilised more recently for historic vessel conservation management. Key questions such as how this data is utilised, and what is it that the capture of such data is trying to achieve for the conservation and management of historic ships and vessels will be explored. In addition, this paper will introduce information modelling, most commonly seen as Building Information Modelling (BIM) as an approach for furthering the effective management of historic ships and vessels, as well as other historic marine and maritime assets. It will demonstrate that the majority of attempts at utilising BIM in the heritage sector have been limited to buildings, and fall short of utilising its full potential. Through the use of the 'VIM' project at HMS *Victory* the paper will then explore how information modelling can be applied to a highly complex historic ship. The paper will end by discussing the current limitations of using information modelling for conservation management, where advances may be made in the future and what actions need to be taken in order to maximise the benefits of information modelling across the maritime heritage sector more generally.

Community co-production of 3D rock art models in Scotland

Tertia Barnett

The presentation discusses the production of 3D models of prehistoric rock carvings within the context of Scotland's Rock Art Project, a five year research programme based at Historic Environment Scotland. The 3D models are being created by trained community teams as part of a standard recording methodology used to document prehistoric carvings across the country. Digital data gathered by community teams will become publicly accessible online via the project website, and Canmore, the National Record of the Historic Environment of Scotland. This presentation explores the benefits and challenges of using Structure from Motion techniques with local communities at this scale, and discusses the wider implications of this work for rock art research and for public engagement.

Taming the chronology of South Gaulish Samian found at Hadrian's Wall and the German Limes using Linked Open Data

Florian Thiery, Allard Mees

Since the mid-1990s the RGZM (Römisch-Germanisches Zentralmuseum Mainz) provides web-based databases containing millions of datasets with content from many different archaeological disciplines. These relational databases were constructed in interdisciplinary transnational projects and include a lot of "hidden archaeological assumptions". The aim of our paper is to make these hidden assumptions visible and provide them as a Linked Open Data graph to establish reproducible research as a basis for Open Science.

With thanks to our sponsors:



In particular the Samian Research database [1] at the RGZM which is based on the Names on Terra Sigillata project of Leeds and Reading Universities funded by the AHRC offers nearly 250'000 identified potter stamps, which are traditionally dated in a traditional way. In Roman archaeology this is usually expressed by establishing "absolute dates" in well known "from-to" tables, whereas in reality, the situation is much more diffuse. In fact, Samian dating is quite often based upon so-called 'dated sites', which are themselves dated by Samian.

Occurrences of South Gaulish Samian on "historically dated sites" like Hadrian's Wall with its absolute dating or the Wetteraulimes with its less clear dating are difficult to use as dating arguments because it is not possible to say a priori whether these were "survivals" or whether they were part of a still existing South Gaulish export industry. Therefore an RDF (Resource Description Framework) based model has been developed to deal with occurrences making the Samian dating process verifiable and transparent. This paper focuses on modelling dating arguments using a relative chronology based on Allen's interval algebra [2] compared with absolute dates in the prototypical build Academic Meta Tool [2] to create Linked Open Data for reproducible and transparent research. This tool enables the creation of an RDF-based ontology such as for modelling dating arguments and visualising the semantic reasoning for detecting errors.

[1] <http://rgzm.de/samian>

[2] <http://cse.unl.edu/~choueiry/Documents/Allen-CACM1983.pdf>

[3] <http://academic-meta-tool.xyz>

Finding mechanisms for a comparative study of Atlantic Rock Art

Joana Valdez-Tullett

Atlantic Rock Art is a term commonly used to describe an assemblage of prehistoric carved motifs based on an overwhelming circular iconography. Cup-and-ring motifs, cup-marks, wavy grooves and other variations were carved on the landscapes of a number of western European modern countries, such as Scotland, England, Ireland, Spain and Portugal, during Prehistory. The engravings, the type of rocks on which they were depicted and their landscape locations provide the carvings with a sense of homogeneity due to their striking similarities. As such authors have, since early stages, hinted at connections and relationships between some of the aforementioned regions, although these are poorly understood and were never fully explored.

Recent fieldwork developed to assess differences and similarities among the rock art of the western façade revealed that despite the resemblances there are striking variations in Atlantic Rock Art. In order to assess these characteristics and investigate the sense of unity between the regions, I developed a study based on a 4-scale methodology and empirical data documented in five different study areas. The scales of analysis focused on small details of the motifs, their making and carving techniques, revealing certain shared characteristics which implied that a mechanism of systematic cultural transmission was in place, contributing for the widespread of Atlantic Art. Furthermore, other scales of analysis assessed the rock media and the relationship between the latter and the motifs but also the wider landscape in which they were located. This multi-faceted investigation included

With thanks to our sponsors:

human and computational valuations, combining methods ranging from 3D imaging records, GIS and Network Analysis, complemented with a sensorial and experiential perspective. Results revealed a carving tradition which encompassed many resemblances but was still capable of maintaining regional personalities. The study demonstrated the importance of rock art in the narrative of prehistoric Atlantic Europe, contributing for a clearer insight into the connectivity and cultural transmission of the region.

This paper will focus on the methodology applied and the benefits of a multi-disciplinary and multi-scalar approach to the study of rock art.

3D ‘Scotland in miniature’: digital topography, deep neural networks and approaches to national mapping

Dave Cowley, Øivind Due Trier, Łukasz Banaszek, Anders Ueland Waldeland

The increasing availability of extensive complex datasets, including Airborne Laser Scanning (ALS) data, is a world of opportunity. It is also a challenge to develop work practices that can explore the potential archaeological knowledge dividend effectively, especially for the creation of systematic national-scale heritage inventories which are a foundation for heritage management and research. This paper presents work on the Island of Arran, often referred to as ‘Scotland in miniature’ because it encompasses many of the landscape types of the country as a whole. Historic Environment Scotland is using this outdoor laboratory to develop approaches to extensive and rapid archaeological landscape mapping and the exploration of computational approaches to object detection using deep neural networks.

One strand of this work concerns manual mapping of the archaeological landscape. This foregrounds remotely sensed data (ALS) as the primary source of information, supplemented by orthophotographs and field observation, requiring multi-scaled desk-based interpretation of ALS derivatives, the documentation of certainty of interpretation, and an iterative, selective approach to field observation. The latter is used primarily to improve the interpretational certainty of those desk-based identifications with low confidence levels. This approach has achieved considerable increases in rates of area coverage over methods of field survey that largely rely on field walking to cover the ground. For Arran, the project has also generated a three-fold increase in the number of known monuments. The second strand of the work, undertaken with the Norwegian Computing Center, is exploring the potential of deep learning for national mapping of cultural heritage. This approach is based on the height data and learning sets comprising the centre positions of known archaeological remains. The deep neural network used in this work had already been pre-trained on one million images of natural scenes, and outputs a vector of presence/absence of objects of potential interest. Cross-validation of outputs with known cultural heritage remains, supplemented by field checking, indicates a success rate, so far, of about 90% positive identifications.

This paper concludes with thoughts on how the combination of approaches tested on Arran can be extended to support the cost-effective and rapid national mapping of Scotland.

With thanks to our sponsors:

Digital heritage: Practical applications of digital technologies for conservation and asset management of historic sites

Joann Russell, Sofia Antonopoulou, Lyn Wilson, Al Rawlinson, James Hepher

Historic Environment Scotland is the lead public body set up in 2015 to investigate, care for and promote Scotland's historic environment. HES is responsible for the conservation and operational management of 336 historic sites across Scotland (Properties in Care) on behalf of Scottish Ministers under the Scheme of Delegation.

In the absence of a commercially available heritage asset management system that is not based on asset obsolescence or asset renewal, Historic Environment Scotland is developing a bespoke digital asset management system to manage operations, inform decisions and prioritise investment.

This Properties in Care Asset Management System (PICAMS) is a programme of digital transformation, which will link and provide access to a wide range of disparate data sets relating to the Properties in Care, including information relating to designation, significance, condition, facilities management, archaeology, climate change, digital image and drawing archives, as well as a growing collection of 3D spatial datasets.

The Rae Project is a long-term ambitious programme to digitally document in 3D all of the Properties in Care and objects from their associated collections. The resulting data constitutes a baseline record of the estate and is being used to inform conservation, asset management, interpretation and research projects, as well as improve (virtual) access to the properties.

In parallel with digital documentation projects, HES is developing the use of visualisation, 3D modelling, 3D printing and gaming technologies for conservation applications.

Other key digital systems feeding into PICAMS are Building Information Modelling and HES-SIGMA. HES is currently leading the heritage application of BIM in Scotland, exploring and developing BIM as a holistic tool to manage and access relevant inter-related digital datasets both for project delivery and asset management.

HES-SIGMA is an innovative condition-monitoring tool developed by the British Geological Survey and HES, which facilitates condition surveys for the Properties in Care through a mobile GIS-based application. The data can be used to monitor the condition of the sites, quantify the effect of conservation works and prioritise investment across the Estate.

This presentation will outline each of these digital technology applications within HES, in relation to a series of case studies on Stirling Castle.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

The application of precision agricultural techniques to archaeological survey. The NDVI index applied to the study of the Iter XXXIV Roman road in the province of Álava (Spain)

J.J. Fuldain, F.R. Varón

The Iter 34 is the Roman road that crosses the province of Álava from west to east. Since the 18th century several different routes through the area have been proposed; since no specific path is officially recognized, the remains of the road do not enjoy heritage protection. In 2017 we made a project to determine the course of the road through rural Álava. In addition to traditional archaeological excavation and prospecting techniques, we used drones to take NDVI infrared images to create high-resolution orthomosaic plans of 10 cultivated areas through which the road is conjectured to pass. During the photosynthesis process plants reflect great amounts of infrared energy which can be captured with infrared cameras. By comparing the infrared and the visible spectrums we can clearly see the subtlest differences within the health of a crop, so that any crop marks are much clearer than in conventional photographs.

Thanks to the NDVI orthomosaics, remains of the roadway were identified not only in places where we already knew it existed but also in previously unknown locations. Furthermore, other archaeological features were identified close to the roadway. This successful experiment heralds a great advance in non-invasive techniques of archaeological surveying. By using precision farming techniques we have identified the course of the Roman road Iter XXXIV in several locations in a short period of time and with few resources.

Roman Frontier or Fortified Road? GIS Analysis of the Gask Ridge

Kathryn Murphy

Shortly after arriving in Scotland in the early AD 70s, the Roman Army constructed a series of forts, fortlets, and towers in the central belt between the Forth-Clyde valley and the river Tay. This assembly of Roman military infrastructure is known as the Gask Frontier or Gask System, as the main line of towers stand along the Gask Ridge. These forts and towers predate all other frontier systems in the Roman Empire, and are therefore regarded as a prototype frontier. The Gask system consists of three sections: the Gask Ridge line, which is located along a Roman road; the Highland line, with forts located at the entrances to the Highland glens; and the Strathmore line, which is likely a northern continuation of the Gask Ridge line. It is thought that the towers would have been used to monitor the surrounding landscape, and pass important messages or warnings to the forts, leading to the mobilisation of soldiers if needed. This monitoring and communication system is why these lines of forts and towers have been called a frontier, as it would allow the Roman Army to protect the Roman-controlled territory that lies to the south-east of the Gask Ridge, and keep the locals under control. For this frontier system to function properly, excellent visibility from the towers, and good intervisibility between the towers and forts is required. This paper will use regular, cumulative, fuzzy and probable viewshed analysis methods to analyse the visibility from and between the infrastructure that makes up the Gask Ridge system and determine if it has the visibility required to function as a frontier, or if it was designed to serve another purpose, such as a fortified road system.

With thanks to our sponsors:

Friday 26th October – Lower Hall

Visualising and researching complex prehistoric cemetery sites: the Ossi project (Sardinia, Italy)

Guillaume Robin, Florian Soula

Sardinia (Italy) is known for its rich heritage of standing prehistoric monuments, ranging from Neolithic megalithic sites, to Copper Age rock-cut tombs and Bronze Age nuraghi towers. Rock-cut tomb cemeteries present a double challenge for archaeologists. The first one is documentation: each tomb represents a complex underground architecture, and up to 20 of them can be scattered over the irregular landscape of a cemetery. No satisfactory methods have been applied so far to record and present such complex spatial information. The second challenge is contextualisation: very little research has been devoted to the broader landscape context of these Sardinian cemeteries and their relationship with settlements. This paper presents the results of a recent project in Ossi (Northwest Sardinia), where rock-cut tomb cemeteries dating from the Late Neolithic to the Middle Bronze Age have been surveyed, using close-range and drone photogrammetry combined with dGPS geo-referencing. Systematic fieldwalking around the cemeteries have been carried out in order to produce a detailed dGPS distribution map of surface finds and structures, which suggest settlement areas associated with the cemeteries. All the results were grouped together and processed in a GIS platform. The project shows how an integrated methodological package not only help record and present complex archaeological spatial data, but also tackle specific social questions about the cultural use of the landscape in the past.

Digging into Early Colonial Mexico: old sources, new approaches

Raquel Licerias-Garrido, Patricia Murrieta-Flores, Ian Gregory, Bruno Martins, Diego Jimenez-Badillo, Mariana Favila, Katherine Bellamy

The Digging into Early Colonial Mexico (DigCH) project is a T-AP funded collaboration between the Universities of Lancaster (UK), Lisbon (POR) and the National Institute of Anthropology and History (MEX). The main purpose of the project is the analysis of the corpus known as Relaciones Geográficas de la Nueva España (The Geographic Relations of New Spain) compiled during the 16th century by the Spanish Crown, and particularly those documents related to Mexico and Central America.

The Relaciones Geográficas are an essential source of knowledge about history, geography, culture, religion, economy and ethnicity, as well as the relationships between indigenous and colonial officers within the Viceroyalty of New Spain. They present a complex and interesting linguistic structure composed by descriptions in Spanish mixed with places, other proper names, and terms in indigenous languages, particularly Nahuatl. This makes the Relaciones Geográficas a multifaceted and exceptionally rich corpus in terms of both, linguistic and geographic exploration.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ARAINNEACHD
EACHDRAIDHEIL
ALBA

The project has three broad aims. Firstly, it will create and assess novel computational methods for the exploration of these historical documents. Secondly, it will create a set of complex digital datasets from this corpus, which is one of the most relevant sources of America written in Spanish and peppered with terms in Nahuatl. This will include the production of the first digital 16th century Spanish-Nahuatl Colonial Gazetteer and the first 16th century Colonial GIS for this region. Finally, this information will enable to revisit and answer research questions of crucial importance for this historical period.

In this paper, we will address how modern language technologies including methods and techniques from Natural Language Processing, Corpus Linguistics and Machine Learning, in combination with geospatial analysis, are facilitating a new way of approaching these kind of historical documents and the challenges they also pose. We will present how this interdisciplinary methodology is enabling us to explore and identify linguistic, semantic, geographic and historical patterns, through the semi-automated analysis of thousands of documents that contain more than 2.8 million words in different European and non-European languages.

Rise of the machines: automating photogrammetry for on mass digitisation of objects in archaeology and heritage

Richard Allen, Ardern Beaman-Hulme

Photogrammetry is a powerful tool that is fast gaining ground in the field of archaeology in order to produce 3D models for visualisation, geometric morphometric analysis, and digital archiving. It can be relatively less expensive, faster and more portable than other techniques such as structured light and laser scanning; whilst still producing models of comparable accuracy. However, one of the challenges in zooarchaeology and geometric morphometric analysis in particular is sample population size. Generally, large datasets are required in order for analyses and inferences to be robust; this can range from hundreds to thousands of 3D models. With each model potentially requiring several hundred photos, manual photography presents a huge bottle neck in the process of data acquisition. Here we present an automated photogrammetry rig that was initially developed using Lego and later turned into a commercialised out of the box solution in order to help overcome these sample volume issues. We will also discuss briefly how other parts of the photogrammetric work-flow from photos to model can be streamlined with large datasets in mind.

The True Cost of Digital Data Session

CIfA - Information Management Special Interest Group Session

Digital Data Capture – Cost or Benefit?

David Andrews

This presentation will examine the costs of recording historic buildings and archaeological sites using modern survey technology such as laser scanning and SfM photogrammetry.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

In the last 10-15 years general survey industry has comprehensively adopted laser scanning as the most cost effective route to achieving measured building survey and a number of firms are also increasingly using SfM photogrammetry to supplement or in some cases replace laser scan data. General capital and on-going costs for purchasing laser scanning equipment and software will be presented and compared with the lower start-up costs of photogrammetry. The relative efficiencies of using both techniques compared with hand planning or TST survey will then be discussed. Another alternative is to sub-contract recording work to a dedicated survey company and average costs for this will be examined. Finally case studies of a recent laser scan surveys of archaeological excavations and standing building survey will be presented.

Digital Archaeology, but at What Cost? Supporting Curators in Managing the Heritage Resource

Damien Campbell-Bell

With the increasingly frequent use of digital technologies to record archaeological sites and historic structures there are a broad range of concerns which need to be addressed. One of the key factors is cost, but this may be interpreted in multiple ways. There are evidently considerations in terms of labour and financial cost in the use of digital technologies, but if the techniques are not properly understood, there are also potential costs for the archaeological record. The UK has a well-established system for overseeing archaeological works and industry standards which should be followed, however whilst standards exist for digital recording they are generally less well understood. A key aim of archaeology is preservation by record, and if quality standards for recording archaeology are to be maintained as we move increasingly to digital methods, curators must be able to confidently assess the suitability of methodologies and results. This paper will discuss what we may set as a baseline for the information curators should be aware of, and what methods practitioners can use to ensure that their work can be easily assessed. By helping curators in this way we can ensure that the industry continues to generate a high quality archaeological record and avoid negative impacts to our understanding of the heritage resource.

Use It Or Lose It

Chris Casswell

Digital techniques and workflows have swiftly evolved to now underpin every major industry in the world; yet archaeology has fallen severely behind in our approach to collecting and managing digital archaeological data.

For too long the heritage sector has debated the best course of action to tackling the digital data management issue. At DigVentures, we forged ahead with a solution by fundamentally changing our approach and workflow to embrace digital from project design through to publication.

DV firmly advocates a born-digital approach to the archaeological process, making data available from collection to archiving. As soon as information is collected on site it is published online for the world to see, comment and collaborate on through Digital Dig Team (<https://digventures.com/digital-dig-team/>). This archaeological

With thanks to our sponsors:

recording system is more than just a tool for fieldworkers; it is amplified through social media channels, so that our projects are just a click away from anyone who wishes to view or participate.

Upon completion, reports are submitted to the ADS and entire project archives are maintained online through Digital Dig Team and project microsites with a strong emphasis on preservation by use. We believe that it is only through embracing a born-digital approach to every part of the archaeological process, from all parts of the sector, that we can achieve a cost-effective way of archiving and using digital data.

Digital archives in archaeology; the Scottish context

Emily Nimmo

Within Historic Environment Scotland, the role as place of deposit for archaeological archives is stronger than ever with functions of collecting and protecting archives enshrined in law. The Digital Archive in HES has been busy, making huge strides in renewing the technical infrastructure that underpins the work to ensure the long term preservation of our digital archives. HES has been working with a commercial partner, Preservica, to integrate their system with our own repository service and enabling automation to free up existing resource. HES are looking at possible ways to extend this service to partners, such as RCAHMW, through shared tenancy options provided by Preservica. The paper discusses the background to the Scottish sector, drawing on the survey of commercial archaeological companies (2012) and highlighting preliminary findings from a repeated survey (2016). Outlining the existing situation for digital archives in Scotland, the similarities and differences between England, Scotland and Wales are discussed in the context of the Bedern Group which seeks to work together to make it easier for the organisations working across these boundaries. The future for the Digital Archive services at HES is considered with emphasis on developing strong partnership links. Initiatives like Scottish Historic Environment Data Strategy (SHED) and projects such as Scotland's Urban Past help co-ordinate all aspects of the heritage community to capture and bring together valuable data sets and make these available through the Canmore website.

From 'dirty' data to accessible resource

Eva Fairnell

The output or end-product of a digital project can take many forms, from 3D images to searchable online databases. While the latter may seem more straightforward, there are in fact many issues to address in order to generate a user-friendly, stable resource that draws on data from many disparate sources. Even if guidelines for data submission are provided, when managing a project, what you ask for is not necessarily what you get. The spectre of 'dirty data' has to be addressed at some stage, so that the data submitted are in the required format for the proposed host platform to use. In order to maximise both the input and output, it may be necessary for an intermediary stage to invest in cleaning the data, liaising with both the data suppliers and the product developer, to ensure an efficient transfer and successful result. It is easy to underestimate the time required for this vital part of product research and development, which nevertheless has to be budgeted for. Using the

With thanks to our sponsors:

National Zooarchaeological Reference Resource (NZRR; http://archaeologydataservice.ac.uk/archives/view/nzrr_he_2017/) as a case study, this presentation will discuss examples of issues that need to be resolved.

Investigating Shetland's Iron Age archaeology with old and new survey records

Li Sou, Julie Bond, Stephen Dockrill, Val Turner, Andrew Wilson, Lyn Wilson

This paper presents the on-going doctoral research project, *Visualising the Crucible of Shetland's Broch Building*. It is using historic records and newly acquired digital survey data from terrestrial laser scanning and Structure-from-Motion photogrammetry to understand how three significant broch sites in Shetland; Jarlshof, Mousa and Old Scatness, and associated structures were constructed and used in prehistory, through analysis of their architecture and standing remains.

Brochs are monumental Iron Age (c.400-200 BC) dry-stone towers or roundhouses, only found in Scotland. Whilst the structural layout of brochs has long been debated, few measured surveys have been conducted at many sites (Cavers et al 2015). As such this project is significant in bringing together new up-to-date 3D data and digital processing of old survey records, ranging from photos, illustrations and earlier laser scans, that will also aid in understanding the history of consolidation and the rate of weathering at the sites. This is essential in developing management plans for future condition monitoring and conservation of the sites, which are on the UK's Tentative List for World Heritage Status. The research conducted to date and methods of analysis will be discussed.

Saturday 27th October – Main Hall

Keynote – How Agent-based Modeling Can Help

Stefani Crabtree

Where imagination fails: New possibilities of presenting the unexcavated

Josef Souček, Lucia Michielin

Italian "cultural heritage" legislation identifies valorisation of sites as one of the pillars of archaeological research. This results in the rising importance of creating proficient public archaeology plans that will engage the public on a multitude of levels. The Aeclanum excavation, which was born from a partnership between the University of Edinburgh and the Apolline Project, recognises the necessity of including and engaging the public in its newest discoveries. A major part of the ancient town remains unexcavated, however, there is a large amount of new data on the site obtained from a vast geophysical survey carried out over the last two years. Results from this survey are difficult to communicate to the public, but new technology can dramatically improve this situation by employing GPS-based augmented reality. The aim is to create a series of 3D reconstructive models based on the geophysical

With thanks to our sponsors:

results. These models will then be input into a system that will allow the public access to these models, when triggered by GPS coordinates or by detecting a predefined image. In this way the visitors will be able to see a rough interpretation and volume of structures on the spot where they used to stand. All of this will offset the need for further extensive excavations that could put the archaeological remains at the risk of deterioration.

Demonstrator for data integration

Ceri Binding, Douglas Tudhope

As part of a semantic data integration case study for ARIADNE, we developed a web demonstrator capable of cross searching data records originating from multiple archaeological datasets combined with selected metadata extracted from multilingual grey literature documents. This was achieved by the use of a common ontological model (CIDOC Conceptual Reference Model - CRM) with names of materials and object types mapped to Getty Art & Architecture Thesaurus (AAT) concepts.

Data cleansing and vocabulary alignment proved problematic with respect to periods and dates. Although dating is obviously a significant aspect of archaeological work the recording of such information in a controlled format is often highly variable in practice, this is inevitable as each local study is probably less concerned with wider interoperability issues. In addition textual representations of date spans obtained via Natural Language Processing (NLP) can have a multitude of incompatible formats leading to subsequent data retrieval issues. Records referring to e.g. Pictish, Iron Age, L'âge du fer, Long Iron Age, Roman, Early Medieval, 405 AD, Early 5th Century, V Secolo a.C. could all actually be contemporary or overlap - but different queries on this data would retrieve different results. An obvious solution was to relate each of the terms to an absolute date span to make the records uniformly temporally comparable. The resulting multilingual data records were directly comparable and searchable by material type, object type and date range, or any combination of these.

One issue encountered in the cleansing/alignment of date spans (and named periods in particular) was the potential for regional differences. In the previous project UK records containing named periods e.g. "Iron Age" were enriched using start/end dates obtained from the Historic England/FISH periods list – however date spans for these periods may well be different in other countries. A recent project (Scottish Archaeological Periods & Ages - ScAPA) has produced an equivalent list for Scottish archaeological periods and associated date ranges with the aim of allowing more fine-grained control in data enrichment of UK records and for use in cross search between separate regional research frameworks.

<http://www.ariadne-infrastructure.eu>

<http://ariadne-lod.isti.cnr.it/description.html>

<http://hypermedia.research.southwales.ac.uk>

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

Filling the Gaps in a Fragmentary Bronze Object: the Contribution of 3D Scanning and Printing Techniques

M. Page, C. Hochart, S. Bentouati N. Timbart, F. Bridey, C. Boust, G. Obein, A. Razet, M.V. Ortiz Segovia

The project interrogates the possibilities of 3D scanning and 3D printing in the fields of archaeology and conservation-restoration. A bronze rim from the Louvre collections, coming from Susa (actual Iran) and dated from the 20th century BC, is undergoing a restoration work. The rim was made of several pieces, initially joined together on a wooden wheel. We focused on one of the pieces, a hollow rim element of u-shape cross-section, itself broken and covered by sediments.

After scanning all pieces with a structured light instrument, the broken parts were digitally assembled. The scanning process was complicated because of the relief of the object as well as its fine texture: we had to find a compromise between measurement time and quality. The digital reconstitution proved itself useful to the conservator by the fine determination of edges and fractures. From the digital model, we inferred the shape of missing parts and selected texture from extant zones which was applied to the digital filling.

3D scanning gave us the shape and texture of the object, but these are not sufficient to fully characterize its appearance: roughness, gloss and colour should be accounted for if we are to print fillings for the rim element. They were recorded with a micro-topographical device, a gloss-meter and a photographic installation. These data (shape, texture, colour and gloss) were then converted into digital information and sent to the 3D printer developed by Océ Print Logic Technologies, which allows the realistic reproduction of the appearance. This specific 3D printing process was carefully managed for the matte and coloured rendering to be possible in relief, by the addition of micro-structures which reduced the glossy aspect of the inks. Printed fillings could then be inserted during a restoration process to improve the legibility of the artefact. This supposes of course a fine study of compatibility between the print and the conservator's code of ethics.

Large-Scale Photogrammetric Recording on Commercial Projects

Roberta Marziani, Vijaya Pieteron, Rebecca Hall

Poster Abstract: The use of 3D modelling in archaeology is being increasingly explored, however it is currently more widely adopted in research and academia than in commercial archaeology. By and large, archaeological site archives generated by commercial units are still more likely to contain hand drawn records than anything produced by more advanced technological means.

Wessex Archaeology is developing its recording methods by using more up-to-date digital recording, primarily in the form of photogrammetry. On sites where grave deposits number in their hundreds, digital models are being produced as a substitute for hand drawing graves, as well as for other archaeological features, such as structures.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ARAINNEACHD
EACHDRAIDHEIL
ALBA

Our adoption of this methodology has encountered a variety of challenges, from software, to staff training, to the sheer number of models to process. Wessex Archaeology are constantly developing the approach to photogrammetric survey on commercial archaeology sites and discovering new ways in which this technology can benefit the fieldwork teams, the company, and the client.

Recording in this manner has proven to be more productive, more efficient, and more accurate. To generate a 3D model of a grave, the feature needs only a series of high quality photographs and survey points produced by a member of the field team. The process takes significantly less time than hand drawing the feature and the output for each model provides more archaeological data in a form that is easier to understand than standard hand-drawn records, due to the presence of photographic imagery and full 3D data. This allows us a far better understanding of the archaeology, and produces more comprehensive reports. Digital technology also offers us greater opportunities for dissemination to the wider public. Thus despite some of the challenges employing photogrammetry on a very large scale, it is now Wessex Archaeology's preferred recording method for graves.

This poster will examine some of the large-scale projects on which Wessex Archaeology has undertaken extensive photogrammetric recording in the last year, and discuss some of the logistical and technical challenges we have faced, and their solutions. It will also look at the conclusions we have drawn from our experiences to date.

Social Media in Digital Heritage Research – data extraction, management and analysis

Marta Krzyzanska, Chiara Bonacchi

The increasingly prominent role of social media in contemporary society has produced a vast amount of social data, often publicly available and easily accessible through the APIs of platforms such as Facebook and Twitter. This 'big data' has recently been leveraged to research a range of social phenomena, including the role of heritage in the construction of political identities (Bonacchi et al; forthcoming 2018). In this paper, we will discuss methodologies for conducting 'big social data' research, and compare a range of techniques of data extraction, management and analysis. We will examine the advantages and limitations of using platforms' APIs, and present alternative procedures for data collection, such as Scrapy. We will also compare different formal methods of analysis, and their implementations via different software solutions and programming languages including R and Python. The methods we will review topic modelling, sentiment analysis and network analysis, and the paper will critically reflect on their applicability to different types of data, in particular those extracted from Facebook and Twitter. Finally, we will present a strategy for the management and integration of large amounts of unstructured web datasets that utilises the non-relational Mongo Database and cloud computing. This paper draws on examples from the ongoing Digital Heritage research that we are conducting as part of the 'Ancient Identities in Modern Britain' project (ancientidentities.org).

With thanks to our sponsors:

A QGIS plugin to explore landscape connectivity through circuit theory

Guillem Domingo Ribas

Archaeological studies traditionally make use of Least-Cost Path Networks to study landscape mobility. This method is the most common approach to predict or reconstruct ancient routes, whose path is seldom known. The reconstruction of communication lines in the landscape through LCP is often criticised as it can only compute a single route between two points. Nevertheless, different approaches to landscape mobility may help to overcome this constraint. Functional connectivity models have been developed by other fields such as ecology, evolution and conservation, which have various advantages over LCP.

One of these explores circuit theory as well as random walk theory and its application in landscape connectivity. It is an approach that has been broadly used in several areas with success. Landscape is displayed by networks of nodes or raster cells to create circuit representations of a territory, which will be used to calculate the approximate resistance values of the different features within it. From this framework, circuit-theoretic models will provide distinct possible paths. Thus, storing various feasible routes can be more effective than having one single optimal path with views to studying mobility.

The current research aims to create a new plugin for QGIS with Python which implements this alternative in the study of landscape archaeology. After the creation of the new tool, the plugin will be tested with the EUROEVOL dataset (<https://www.ucl.ac.uk/euroevol>), specifically for the Neolithic transition in Central Europe. This case study will be analysed with LCP and the new approach, whose preliminary results will be compared and presented in the congress. Moreover, the presentation will focus on the benefits and constraints for Archaeological research identified in both outcomes.

The plugin will be available in the QGIS repository and it will also become a beneficial tool for researchers in the aforementioned fields.

Classifying Digital Research Methods: Linked Ancient World Data in Context

Sarah Middle

Linked Data is an implementation of the Semantic Web, connecting digital objects across datasets in a machine-readable way. It facilitates searching across multiple collections and reveals relationships between resources that could not otherwise be determined. As such, Linked Data has the potential to transform research involving online material, including that done in the Humanities. However, its adoption in this area remains minimal, and little research has been conducted into the use of existing Linked Data tools/resources (as opposed to production of new ones). Within the Humanities, there has been a relatively high uptake of Linked Data in disciplines relating to the Ancient World. My PhD looks at how this approach might be integrated with existing methodologies for Ancient World research. This includes investigating the end user experience of Linked Data tools/resources and identifying specific research methods for which they are (or might be) used.

With thanks to our sponsors:

The user research component of my PhD will start with a survey of Ancient World researchers in spring 2018, about their experiences of using/producing Linked Data in the context of digital tools/resources more generally. Research methods associated with tools/resources by survey participants will be classified using the Taxonomy for Digital Research Activities in the Humanities (TaDiRAH - <http://tadirah.dariah.eu/>) - an ontology describing research methods, techniques and information resources. TaDiRAH itself utilises Linked Data technologies, and will be used as a framework to connect data about the tools/resources.

Visualising relationships between Linked Ancient World Data tools/resources based on their associated research methods will provide an insight into methodologies that might be particularly amenable to Linked Data integration. Analysing this data alongside users' comments about their experiences of these tools/resources will demonstrate their relative effectiveness when performing those research methods, in comparison with non-Linked Data tools/resources.

This paper will start with a brief overview of Linked Data, and the survey construction methodology. I will then explore what my findings demonstrate about the current state of Linked Data use in Archaeology and related disciplines, with reference to example tools/resources, and conclude with recommendations for future tool/resource development.

Offshore Scotland and archaeology: the challenge of big data

Stephanie Said, Abby Mynett

Offshore development work, undertaken for the developers of windfarms, aggregate dredging, ports and cables and pipelines, now accounts for the bulk of commercial marine archaeological work carried out in the UK. This work depends very heavily upon access to the often huge quantities of marine geophysical and geotechnical data acquired by offshore survey companies for these schemes. With a particular emphasis on offshore Scotland, this paper will examine when and how this data is processed and interpreted by archaeologists and how the results are used by archaeologists to inform mitigation measures put in place by regulators and developers to protect and preserve archaeology during the construction phases of these schemes.

HES-SIGMA: a new geo-spatial data capture tool for managing the conservation of historic assets

E.A. Tracey, N. Smith, K. Lawrie, J. Russell

The British Geological Survey (BGS) has worked with Historic Environment Scotland (HES) to develop an integrated digital site assessment system that provides a refined survey process for historic assets.

HES has a statutory obligation to conserve the 336 properties in care of Scottish Ministers without compromising the cultural significance of the assets. The condition, statutory compliance, operations and interventions associated with these assets must be appropriately recorded, monitored, reported and reviewed. Similar to other

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

heritage agencies, HES needs a system that can store and present conservation and maintenance information for historic assets and be used to plan effective programmes of maintenance and repair. To meet this need, BGS has worked with HES to develop new, customised tools for use within the existing BGS System for Integrated Geoscience Mapping (BGS•SIGMA)—an integrated workflow underpinned by a geo-spatial platform for data capture and interpretation—resulting in the provision of an application specifically designed to allow the capture of digital data relating to monument condition.

The new system is named HES•SIGMA. It is built on top of ESRI's ArcGIS software and is underpinned by a bespoke relational data model. It provides users with the ability to populate custom-built data entry forms to record maintenance issues and repair specifications for architectural elements ranging from individual blocks of stone to entire building elevations. Photographs, sketches, and digital documents can be linked to architectural elements to enhance the usability of the data.

The benefits of digital data capture with HES•SIGMA are huge: standardised data formats with supporting dictionaries to constrain the input parameters ensure a high degree of consistency and facilitate data extraction, querying and geospatial analysis; custom-built reporting tools produce fully formatted reports based on collected data; date and time stamps combined with the capability to re-survey monuments at regular intervals facilitates condition monitoring over time, all of which creates a versatile planning tool for scheduling works, specifying materials, identifying skills needed for repairs, and allocating resources.

The digital data collection principles on which HES•SIGMA is built, i.e. the capability to capture attributed data geospatially, provides many potential applications in conservation, archaeology and similar fields.

Wemyss Caves 4D: a digital future for the Pictish Wemyss Caves, Fife Scotland

Mike Arrowsmith

Wemyss Caves 4D is a collaborative digital documentation and interpretation project involving archaeologists from the SCAPE Trust, University of St Andrews and the community group Save the Wemyss Ancient Caves Society (SWACS). The project website introduces a worldwide audience to renowned Pictish carvings inscribed into the walls of the Wemyss Caves in Fife, Scotland. Most of the caves are difficult to access and all are directly threatened by coastal erosion, structural instability and vandalism.

Laser scanning and convergence photogrammetric survey techniques were applied to eight hundred metres of coastline and eight caves to document the carvings within their setting. Individual carvings were recorded by community volunteers using Reflectance Transformation Imaging (RTI).

The massive resulting dataset was simplified and combined with historic content to present a coherent interactive digital resource that allows users to explore a realistic virtual model of the caves; examine the carvings; access additional information, and even travel back in time to see the caves as the Picts would have done.

With thanks to our sponsors:

Within each cave, context-relevant material (image gallery, video, RTI scan etc.) can be called up via a popup viewer. These viewers are self-contained modules which integrate into the main code, allowing for more content types to be seamlessly added to the site via the application programming interface (API).

Achieving a responsive design for the website necessitated amending the WebRTI viewer developed by the Visual Computing Lab of the Italian National Research Council and further modifications to other third party components such as the panorama viewer to enable communication between them and the core code.

Content is also organised through a filterable catalogue allowing the considerable resources to be accessed through a single click. The back-end database allows us to easily add new or rediscovered content.

This presentation will discuss the design and technical challenges of the website, in which we sought to create a balance between the interactive interface designed to give some simulation of the experience of being in the caves with a practical and intuitive way of accessing the rich and detailed content relating to the caves and carvings.

Saturday 27th October – Lower Hall

Twenty years after. Challenges and successes in digital archiving

Tim Evans

The following paper provides a reflective historiography on the ongoing work of the Archaeology Data Service (ADS), the only accredited UK digital archive for archaeological data. As the organisation moves past its twentieth year the landscape it inhabits has changed considerably. At a practical level archives are now bigger, more varied (encompassing both research and development-led sources) and composed of more 'complex' data-types than previously encountered. Within a wider context, the concepts around what a data archive should be and do have changed significantly: the growth of the Open Access movement, the increased necessity and requirement to provide or aggregate data with national and international partners, the concept of data as a citable publication/output, and the responsibilities that come with peer-accreditation of digital repositories.

Against this backdrop the ADS has continued to rise to any challenges, and to persevere to develop and adhere to best practice in order to stay true to its founding principles of providing free access to digital materials in perpetuity. This paper aims to share with the audience some of these challenges so as to provide insight and understanding about what the ADS do, and why we do it. The paper also outlines some of the problems and opportunities on the horizon, and presents a self-critical yet optimistic perspective on how the ADS can continue to improve and best serve its community of users.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

Adventures in Open Data

Alex Adamson, Peter McKeague

The Open Data Strategy was published by the Scottish Government in 2015. The Strategy sets out an ambition for making public sector data open and available for others to use and re-use. In promoting Open Data, the Scottish Government recognize that Making data Open offers a number of benefits including improved public services and wider social and economic benefits through innovative use of the data.

As with other initiatives such as the INSPIRE Directive, the strategy focuses solely on information created by the Public Sector. It does not address the symbiotic relationship of those who create and use data with those who curate the data. Adoption of an Open Data approach offers significant benefits to everyone in the data life cycle improving both access to and re-use of data. The paper will review the tentative steps towards making data from the National Record of the Historic Environment available as Open Data. It will highlight where to find that data and illustrate some of the potential benefits to end-users of that data including data downloads and remote access of spatial data through web services and accessing controlled terminologies, including thesauri and the recently published work on Scottish Archaeological Periods and Ages. Progress will be benchmarked against Tim Benner-Lee's 5-star Open Data scheme.

However there is much more the sector can do collaboratively. In offering a critique of the inefficiencies of persisting with established analogue approaches to handling data, case studies will highlight the benefits of adopting an Open Data approach across the heritage sector.

“The joys of upgrading!” Or, lessons learned from a simple upgrade

Tom Cromwell

This paper follows on from the New Systems for Old and Into the Field with Intrasis CAA UK papers given in 2009 and 2011, where we at Fort Cumberland first explained how we chose and implemented our digital recording system. The world of digital recording doesn't stand still - we recently upgraded our decade-old off-the-shelf software (Intrasis) to the latest version, incorporating a partial revision of our data template and a wholesale replacement of associated hardware, and thought we'd share our new findings with anyone contemplating a similar task with any of the currently available systems on the market. Our goals were driven by the increased potential to empower users to do more with their data, and included keeping our system current, exploiting a number of significant software improvements, and getting ready for wireless networking as a precursor to true “trench-side” digital recording.

Fundamental changes to the new software presented challenges migrating existing databases, and also caused us to re-evaluate some of our existing working practices and most of our training materials to match the new interface – activities that were probably long overdue. There was a cost in terms of highly-skilled staff time to carry out the upgrade and revise both materials and procedures, a new training cost for

With thanks to our sponsors:

existing staff, and a cost in terms of project management that are all additional to the headline costs of actual software and hardware, and also are additional to the normal running cost of the system. Using our specific example with Intrasis, the aim of this paper is to highlight the broad processes and key issues that will confront anyone trying to maintain a complex digital recording system over the long term so they can plan effectively. It should be of interest to developers, users, and managers alike.

Using GIS to Understand Climate Change Risk in the Historic Environment

David Harkin, Mairi Davies, Emily Tracey

Historic Environment Scotland (HES) has duties under the Climate Change (Scotland) Act 2009 that require it to contribute to climate change adaptation. HES is key to the delivery of Climate Ready Scotland: Scottish Climate Change Adaptation Programme. HES has planned an informed and pragmatic approach to recognising and understanding the risks, and opportunities, that a changing climate presents the historic environment with. This includes understanding the risk and impacts of climate change on our own estate of 336 Properties in Care of Scottish Ministers.

Our approach to identifying 'at risk' sites on our estate has been shaped by working in close partnership with other organisations, including the British Geological Survey and the Scottish Environment Protection Agency. This collaborative project provided an opportunity for public sector bodies to bring together scientific data and technological innovation in order to devise a new methodology that aims to identify the effects of Climate Change on Scotland's historic environment.

Existing spatial data from these organisations was compiled and managed in a Geographic Information System (GIS) Project using ESRI ArcGIS 10.1 software. The datasets contained information on susceptibility, probability and scale for natural hazards such as coastal erosion and flooding. By combining this data with spatial data pertaining to our own estate we have been able to develop a screening tool for natural hazards that has been able to inform the most thorough risk assessment carried out to date on HES' Properties in Care. By screening for natural hazards we have been able to identify the properties we believe to be most at risk from future climate change, as the severity and occurrence rates of natural hazards, such as flooding, is intrinsically linked to climate variables such as precipitation.

The results of this initial assessment are already informing conservation and maintenance through our Asset Management Plan and Investment Plan (2018). By building in climate change risk to strategic planning, we are increasing the inherent resilience of the historic environment to cope with altering environmental and climatic conditions, helping to safeguard it for future generations.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

Flexibility and efficiency

Karin Lund, Jane Jansen

When it comes to Archaeology, there are different approaches to information and data collection. There can be structure or anarchy. Structure is represented by formalized data collection down to every point. Anarchy on the other side is characterized by a lack of rules and the documentation becomes individual, based on knowledge, archaeological questions, number of staff etc.

Intrasis stands for something else, that we can call Structured Anarchy, where you actually can have both approaches. It's the project managers who decide. Once you have decided which information to store, you can always reuse the settings you have made or alter it for different project approaches. Due to the flexibility of Intrasis, and the structured data model, your data always allows the same type of output, analysis by Wizards etc. Intrasis capability to store data from different disciplines, all according to the needs of each specialist, also makes it truly interdisciplinary.

Intrasis is a combined database and GIS, especially designed for archaeology. It is used throughout the whole excavation process, from import of survey and input of archaeological data, through analysis, to layouts of maps for the report. You use the same software for all projects and that is how it will be an efficient tool that everyone easily gets familiar with.

We will in this paper show how Intrasis can be used in projects with different approaches, excavation methods or goals.

Studying Animal Mummies: An exploration of non-invasive surface and content recording techniques and their application to mummy collections

Lidija M. McKnight, Lee Robert McStein

This paper discusses the application of non-invasive imaging modalities to a selection of ancient Egyptian animal mummies and associated votive artefacts from the Manchester Museum collection. The pilot study had four main objectives: 1) to assess the viability of photogrammetry as a surface recording medium for research and digital display, 2) to assess the possibility of generating end-process data of sufficient quality for engagement and the remote study of collections, 3) to determine the viability of photogrammetry datasets for 3D printing applications, and 4) to investigate the potential of merging data acquired through CT scanning with surface scanning data for visualisation purposes.

A replicable photogrammetry methodology using readily available equipment and basic consumables is outlined, highlighting the accessibility of the technique as a research tool for museums, heritage professionals and volunteers, many of whom have limited resources and for fragile artefacts which cannot be excessively handled. The methodology was designed to be adaptable, enabling modification dependent on size and observing any conservation concerns over the condition of the artefact being studied. The clinical radiographic methodology for the study of animal mummies will be described and the potential for merging comparable datasets will be investigated as a means of making these fragile artefacts accessible to visitors and researchers.

With thanks to our sponsors:

The results of the pilot will be discussed, showcasing the accessibility of non-invasive research methods available to study ancient mummified remains.

From Trowel to Headsets: Comparing modes of digital engagement for archaeological sites and their dissemination

David Strachan, Sophie Nicol, Catherine Anne Cassidy, Alan Miller

The scale in which it is possible to record, archive and interpret archaeological and historical data has qualitatively increased due to the capabilities and capacities of available creative technology tools. This access offers the possibility of better preservation, understanding and sharing of results from archaeological excavations. As part of the Tay Landscape Partnership project, we have conducted archaeological excavations at several sites across the inner Tay estuary area and have developed applications that enable engagement with new non-academic audiences. With associated data, the sites were placed back into the digital landscape.

A majority of this work has focused around engaging local communities in the excavation of Moredun Top, the location of a prominent Iron Age hillfort. In this paper we analyse our workflow for creating immersive and mobile representations of the hillfort, both as it is now and as it was in the past. Our methods enable the results of digital interpretation to be deployed and accessed in multiple use case scenarios.

We use a combination of aerial photography, photogrammetry, digital modelling and spherical photography to create digital assets which document the archaeological process, facilitate interpretation of the findings and enable wide engagement with the results. We have applied our workflow to creating digital reconstructions such as Moredun Top, as well as Pictish Forteviot and its surrounding landscape, the cityscape of Perth in 1450, and Abernethy in 1060.

Digital landscapes many kilometres in size were created within the UNREAL4 game engine. The scale that is possible in the software make it possible to provide visual context for the site location. Yet scale also possess a challenge as it requires computing facilities to render not available on modern smart phones. We address this issue by using spherical photography of the reconstruction to create media that is embedded in a virtual reality smart phone application.

CIDOC CRM and CRMarchaeo: A vision of use for the “future”

Stephen Stead

Recent work by Holtorf and May et al (2018) has highlighted the simultaneous desire to pass archaeological knowledge on to the ‘future’; and uncertainty about what that ‘future’ will actually want of our vision of the past. The CIDOC CRM provides a framework for the integration of data from the so-called ‘Memory Institutions’. As such it lays the foundations for integrating data from different communities of documentation practice. In addition CRMarchaeo states that it is “intended to provide all necessary tools to manage and integrate existing documentation in

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ARAINNEACHD
EACHDRAIDHEIL
ALBA

order to formalise knowledge extracted from observations made by archaeologists, recorded in various ways and adopting different standards. In this sense, its purpose is to facilitate the semantic encoding, exchange, interoperability and access of existing archaeological documentation."

Any attempt to regulate archaeological documentation is doomed to failure for two reasons. First is the "three archaeologists- four opinions" meme and the second is the real danger of fossilising the discipline.

So how do integrate access to existing archaeological documentation into a strategy for engaging with the future? This paper sets out a personal perspective on this question. It draws on over 30 years of designing cultural heritage information systems to lay out a vision of why data may be useful to the shadowy and elusive 'future' and perhaps more importantly a motivation for current practitioners to engage in the process.

Integrated data management in commercial Archaeology

Rafael Maya-Torcelly

The continuous development of computer applications are rapidly closing the gap between raw recording of data on the field and visualisation of results. Technologies such as BIM, photogrammetry and laser scanning are becoming more and more common in Heritage related disciplines allowing to increase the quality of data modelling for analytical purposes.

Archaeology is one of the fields where these new approaches are proving to be a real asset. In Headland Archaeology we have a strong commitment to improve the way Heritage is recorded and not only for commercial purposes but also to transmit knowledge to future generations.

As we try to develop our GIS capabilities to be able to provide our clients with accurate predictive modelling analysis, assessing the potential impact of their development projects on Heritage and therefore enhancing mitigation strategies, we realised how much this approach can change the way society understands our discipline. We aim to produce high quality 3D models of our sites with all data integrated within using opensource software not only to reduce costs but having the opportunity to further develop our own plugins: QGIS and Blender.

The implementation of a GIS-based workflow eases the compilation of the results from our projects which can be imported into Blender. The latter has been upgraded from 3D modelling to GIS capabilities thanks to BlenderGIS, a plugin which allows the input of several georeferenced formats into the 3D environment. Photogrammetry models from the archaeological features recorded can then be imported into a 3D environment where the surrounding landscape can be also modelled from LiDAR data. This gave us a solid foundation to work in the visualisation of the data without losing accuracy nor making up anything that is not based in the actual archaeological data.

After this first step is set up we can work towards visualisation and 3d modelling for outreach purposes but always showing where the border between archaeological fact and virtual reconstruction stands to produce an accurate model from the past projected to the present and the future.

With thanks to our sponsors:



Society of Antiquaries
of Scotland



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA