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Abstracts



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Urban Archaeology and “Correct” documentation

Documenting the Data

"Beauty is truth, truth beauty,-that is all
Ye know on earth, and all ye need to know."
(Keats: "Ode on a Grecian Urn")

Documentation of archaeological and cultural heritage sites is at the heart of the archaeological process and an important component in cultural heritage research and presentation. It is an essential step without which interpretation and analysis are not possible. It is what makes archaeology and cultural heritage "scientific". Maybe we are storytellers. If so, the type of story we tell is heavily influenced by our way of collecting and organising our archaeological data.

But can we speak about CORRECT documentation or should we talk only about usable and non-usable documentation?

The contemporary field is plagued by the involvement of operators each with their own new tools. They propose solutions and suggest methods but are often in blissful ignorance of the past investigations of the item, site or cultural heritage they are working on. New technology, however, has to support our research. Its use still depends on what we want to know next (our research). The best solution is to have an underpinning of basic documentation that allows any new researcher to easily access the core record. Then they can then enrich the documentation with the results of their new method, analysis and ideas.

It may be possible to build the ultimate recording system, but the information we feed it is always potentially unreliable. How do we *know* when our record is good - has integrity? What indicates that it might be bad – lacking integrity?

Models are there to be used, not believed. Documentation is always for a certain purpose and depending on that purpose, a set of documentation may be regarded as good or bad, as “fit for purpose”. There will never be absolute "true", "correct" or "right" documentation.

An abstract model of documentation should consist of the attributes we record of the real world traits that we observe. The set of attributes that we choose to record (out of the infinite set of possibilities) are the ones that our current state of knowledge and our research aims (and therefore designs) suggest will be the most useful to our current research aims/agenda. If we want to reuse data beyond the current research project/agenda then we must be very explicit about why, how and what we record. This is the so called “para” data and goes beyond metadata to include the “how” and “why” of data capture.

The Scientific Committee

Training 1

Tachymeter aided modelling | Surveying basics for digital documentation of monuments or excavations

(Organisation: W. BEEEX, the Netherlands | St. HOHMANN, Germany | G. VERDIANI, Italy)

In this workshop the participants will be able to work with a tachymeter, images and software in order to digitally create a drawing from (part of) a monument. The participants will also learn the several advantages and disadvantages of this method in order to fully appreciate this technique.

The workshop will be divided in three sessions:

- - Working with a tachymeter
- - Taking useful pictures
- - Software post processing

For each session a specific set of information will be given to enhance the abilities and improve the skills about this survey work on monuments and archaeological sites.

To all the participants it is suggested to bring their cameras (if available) to check it and verify its possible enhancements to allow a better picture taking according to the general workflow presented in the workshop.

Training 2

HandsOn Workshop | Belling the Cat:

Making CIDOC Conceptual Reference Model (CRM) data available as Linked Open Data (LOD):

A practical hands-on workshop of a complete solution using freeware

(Organizers: S. STEAD | M. CHARNO, UK)

The mice meet in council to debate the problem of the new cat in the district. One suggests that a bell should be attached to the cat to give a warning. This is greeted with universal approval until someone asks "How?" Cultural Heritage Informatics specialists are often heard to say "just publish your CRM data as linked open data so that others can use it", but how do we actually do that? This workshop aims to lead attendees through the process of taking an export of delimited text (ie. comma separated values) from their database, converting it to CRM compatible RDF triples and then making them available via a triple store for consumption by humans or machines as linked open data. The course will provide an introduction to linked open data and then will lead users through a cookbook of simple to follow techniques for creating and publishing it. All software used in the workshop will be freeware and runs on the free and open source operating system Linux. The software and operating system are uniquely capable of running on underpowered hardware, making deploying it simple even with limited support from an IT department or support services. The full set of software and guidelines will be available to attendees.

Training 3

HandsOn Workshop 2013 | aSPECT3D

Generating 3D point clouds from digital image sequences (3D ImageScan)

(Organizer: Dominik WESTERMANN | ArcTron3D, Altenthann, Germany)

The aSPECT 3D workshop deals with generating 3D point clouds from unsorted digital image sequences. The recorded photographic data of a suitable object is the source for the 3D point cloud computation. This point cloud can be further edited using different filters before a triangulation is carried out. In another processing step, the meshed 3D model can be photorealistically textured using the referenced images. Finally, the 3D model can be scaled or georeferenced.

Schedule :

- Theoretical, exemplary part:
 - - 3D ImageScan basics
 - - exemplary processing of images to a 3D point cloud
 - - using point filters and triangulation tools
 - - photorealistic texturing
 - - photographic basics (handling exposure, aperture, depth of focus)
 - - classification of suitable objects for 3D ImageScan documentation
- Practical part:
 - - photographic recording of one or several test objects
 - - data management
 - - aSPECT3D application (ImageScan, point filters, triangulation, photorealistic texturing)

ABSTRACTS – ROUND TABLES

Recycling digital data sets for archaeological visualization and analysis

(Organiser: S. M. DUFFY, UK)

As a component of the North Sea Palaeolandscapes Project (2005 – 2006), a variety of data sources, including data collected by the petroleum industry for mineral exploration in the North Sea was reprocessed by archaeologists at Birmingham Archaeology. Reinterrogating the datasets, specialists were able to study more than 20,000 km² of a submerged ancient landscape and map the Early Mesolithic landscape of Doggerland. Therefore, although the original surveys were not designed for archaeological analysis, the digital datasets were, nevertheless, a valuable and reusable resource able to provide meaningful information about a prehistoric hidden archaeological resource. This informal discussion will allow participants to explore the possibilities of reusing digital datasets for archaeological analysis and visualization.

Discussion points include:

- Relevant projects that highlight considerations of best practice as well as implications of reuse
- How to encourage the reuse of datasets in order to maximize their potential
- How to encourage collaboration and sharing of data (especially commercially derived)

- datasets)
- Specific issues related to the reuse of datasets such as:
- Designing new research agendas for old datasets
- Implications of (aging sometimes antiquated) data formats
- Requirements of datasets (e.g. metadata and paradata)
- Considerations of ownership of datasets and
- Issues related to stewardship, preservation and archiving of resulting analysis and output

Gaffney V. Fitch S. and Smith D. (2009). *Europe's Lost World: The Rediscovery of Doggerland*. CBA Research Report.

Gaffney V., Thomson K. and Fitch S. (Eds.) 2007. *Mapping Doggerland: The Mesolithic Landscapes of the Southern North Sea*. Archaeopress. Oxford.

Public databases, accessible virtual reconstructions and interactive museums: new research and learning tools in archaeology

(Organisers: A. M. JASINK | G. VERDIANI, Italy)

In this Round Table there will be the analysis and main features discussion about:

- comparison of different methodological approaches
- application to different archaeological environments and periods
- different collections collections melting (museum of museums)
- e-learning innovation
- research, dissemination

The presentation of the most meaningful experiences, the evaluation of the global feedback from scholars and common people and the debate about the next steps will be the focusing point of this whole Round Table.

International data exchange in archaeology: feasible or just a dream?

(Organiser: Wouter BOASSON, The Netherlands)

High quality documentation has been difficult as long as science exists, it is only that there is a shift in the difficulties of the documentation process. Today's most challenging aspect is probably to address the need for exchanging and sharing data, in a way that makes the contents fully exploitable for the receiver.

It's always been considered difficult if not impossible to even reach agreement on a basic set of properties that should always be present, in every documentation. In The Netherlands we have given this a try in the past 2 years, with some major achievements. We have seen that the major issue is not so much on the contents, but always focusses on some kind of format issue. Unfortunately, the participants usually do not realize this, which leads to discussions where it is hard to close the gap between thinking conceptually and thinking in implementation.

The achievements and proposals in The Netherlands show that most documentation issues with respect to serious scientific use can fairly well be managed by an approach where a harmonized standard data structure for data-exchange and long-term storage will be accompanied by, and linked to, the original source dataset. This asks for carefully designing a very flexible interchange format

based on an object oriented approach, instead of the classical relational or hierarchical approach.
Implementation follows concept!

I would like to invite people to participate in a discussion that focusses on the feasibility of creating an internationally accepted standard for exchanging archaeological research data that is durable and ensures future compatibility. Participants are also asked to clarify how they are documenting today, and why. This is major input for the discussion to answer the question if it is possible to do right to the complex archaeological content when made available in a standardized way.

ABSTRACTS – SESSIONS

Keynote Speech

The benefit of Terrestrial Laser Scanner for archaeology

Christian RUDORFER (City of Vienna, Austria, Urban Survey)

In 2010, the MA 41 – Urban Survey of the City of Vienna decided to purchase a terrestrial laser scanner (TLS) in order to be able to measure and document deformations, volumes and archaeological excavation sites comprehensively.

The data acquisition of irregular surfaces or complex structures can be carried out in relatively short time. The scanned objects can be analysed subsequently without direct access to the surfaces (i.e. also after protection of the excavation site through covering with soil) because the decision which points to extract is taken in the post processing of the scan data and not in the field as with conventional surveying. It is possible to analyse (reconstruct) details which are discovered even after the data acquisition based on the provided images of the TLS system.

The advantages are, on the one hand, the fast and complete data acquisition of the excavation site during the field work and, on the other hand, the ability for comprehensive documentation due to the acquired images and pointclouds. The benefit of TLS will be discussed based on realised projects.

Keywords: terrestrial laser scanner – benefit – data interpretation – field of application

Session: Archaeological Documentation with New Technologies

(Chair: H. THALER, Italy)

On first analysis of the title of this session, one would say that it covers a very wide area. On closer reflection, however, the title itself restricts the content of the papers of this meeting when one considers that a concern with new technologies has been a priority since the first conference. Thus, in the last few years, the development and application of many examples of new technologies have been reported and discussed: from different open GIS systems and open-source software; various applications of total stations; orthophotography, with its algorithms and remote sensing systems; the implementation of the Harris matrix; 2D and 3D open-source software systems; differing survey methods; scientific systems for dating and documenting archaeological finds and features; the use of drones; to laser scanning and 3D photo scanning technology, just to name a few examples. The purpose of this session should be the presentation of new technologies and methods of documentation that have as yet barely been discussed, rather than the repetition of the known.

“New technologies”, however, also involves discussing systems that have become known but are simply still too expensive as well as the possibility of achieving the same or similar results more cost-effectively. The technology is constantly evolving, but, naturally, so are its costs. In recent years we have again experienced a cost explosion regarding new systems, which often require very expensive equipment in terms of both hardware and software. Extremely high-performance computers with very fast and expensive graphics cards are usually prohibitive for archaeologists and archaeological institutions, especially in the era of the Spending Review. Time and again over the years interesting alternatives have been presented – fully in keeping with the spirit of this conference. The setting up of

open-source software and free or less expensive alternatives for some well-known technologies should be maintained, intensified and reinvestigated.

The internet plays an increasingly important role in the process and in the publication and documentation of archaeological data, especially currently during the transition from Internet2 to semantic Internet3, and should therefore also be given due space.

D. ABBASOVA

Application of XRF for element analysis of the jawbone of a prehistoric "Azikh Woman"

Prehistorical "Azikh Woman" was discovered in 1968 in Azikh cave in Azerbaijan Republic by Azerbaijan archeologist Mammadali Huseinov. According to the French paleontologist, Lumlee, the Azikh jawbone is the fourth oldest human relic ever to be found in history. The first was discovered by Richard Leakey (his wife, Mary, and son) in Olduvai Gorge, Tanzania, the second in Kenya, and the third in France. Jawbone has been confirmed to be 350 to 400 thousand years old. Jawbone stored in the National Museum of History of Azerbaijan National Academy of Sciences.

For the first time, element content of jawbone has been provided by using of non-destructive method - XRF (X-ray Fluorescent Spectroscopy). This method allowed to identify for the 25 elements in 35 seconds without sample preparation step. Used equipment has follow parameters: Excitation Source Xray tube, Ta anode, 10-40 keV, 5-50 μ A, five filter positions and detector: Si Pin diode, thermo-electrically cooled, with resolution <280 eV.

Acknowledgment: This work has been done in frame of the IAEA Regional project 8/015- "Using Nuclear Techniques for the Characterisation and Preservation of Cultural Heritage Artefacts in the European Region".

Keywords: XRF, Azikh cave, nuclear technologies, cultural heritage

M. BLOCK-BERLITZ | B. DUCKE

Recording Archaeology with Low-cost UAV: the "Archaeocopter" Project

The federal state of Saxony in south-east Germany boasts a rich archaeological heritage that encompasses tens of thousands of sites and registered monuments, bearing testimony to the cultural and historical importance of the region, both within Germany and Central Europe. The effective protection and curation of this valuable but finite resource requires innovative new technologies with a focus on accuracy, efficiency and intuitive design. The project "Archaeocopter"

(www.archaeocopter.de) is committed to the design and development of unmanned aerial vehicles (UAVs) for airborne image data acquisition in archaeology and related fields. In order to optimise the hardware and software design for real-world applications, the project's research and development work is continuously supported and guided by the state heritage management authorities of Saxony, as well as by academic partners at the University of Applied Sciences Dresden, the Freie Universität Berlin and the German Archaeological Institute.

Our paper will discuss how the "Archaeocopter" project is working to develop time and cost efficient technologies for acquiring high-fidelity, high-resolution imagery and 3D data using ultralight UAV that are cheap to construct, easy to operate and geared towards applications in archaeology and heritage management. We will share insight into UAV design for archaeological applications and issues such

as carrying capacity, flight stability and operational safety. Among our more challenging aims is the implementation of near-realtime 3D reconstruction, that would allow the operator to immediately validate data quality and density.

Keywords: 3D site recording, UAV, multi-view reconstruction, heritage management

M. ANDALORO | R. BIXIO | C. CRESCENZI

The complex of St. Eustache in Göreme, Cappadocia, reading the relationship between the landscape and a very articulated settlement

The settlement of the St. Eustache church is excavated in the volcanic stones in the back part of the Tokali church, this second monument is a very well known rupestrian church in the Cappadocia area, but the structure of the whole settlement in which the Tokali is inserted it's still subject of studies and hypothesis. So the St. Eustache church, with its small room, covered with a vault enriched by a beautiful mural painting, its sepultures and its very articulated system of secondary rooms and tunnels, creates a rich and very challenging subject for the scholar and the surveyor. In fact the St. Eustache settlement is carved in the peaks closing the plateau over the back of the Tokali, because of its higher level it looks directly toward the Uçhisar Castle, placed at a linear distance of four kilometers, creating all the conditions to communicate with this important outpost using visual signals. In the remains of its tunnels, crossing the stone from the plateau to the rear "sword valley" there is the possibility to read the defensive system of the people from that time, where the church, the houses, the farms were working together to guaranty the security to its inhabitants. The digital survey, done using phase shift laser scanner all along the tunnels and all around the stones along the plateau and the "valley of the swords" has created the first complete and detailed documentation of this settlement, allowing the first in deep studies about this meaningful church.

Keywords: Rupestrian, Turkey, digital survey, Mural paints, 3D Laser Scanner

M. ANDALORO | T. PIGNATALE | G. VERDIANI

The Church of Meryem Ana in Göreme, Cappadocia, correct documentation for a meaningful heritage at risk

In the deep core of Turkey, in Cappadocia, the Meryem Ana church in Göreme, is a meaningful place, rich of suggestions, it is carved in an emerging peak, it faces on the "valley of the swords" 25 meters high over the area where the valley becomes narrow. It's a small church, but enriched with wonderful mural paints, showing the stories from the Bible about Mary and Anna, from which its name. The main problem of this church is the large crack dividing in two parts the whole structure, threatening almost the whole church. Other parts of the cave system is already gone lost and the access is done passing through the remains of tunnels and small openings. The water passing by the large crack has partially damaged a large area of the mural paints cancelling their colors. So while our mission was visiting the area during September 2012, it came out clear that there was no time to lose and our group has operated the laser scanner survey of this monument, finding the needed time in an already very dense agenda. The survey work was planned in three main solutions: photographic survey, laser scanner survey, panoramic photos survey. The results are quite impressive, because they allow to read quite

clearly how dramatic is the condition of the crack and to read the extension of this imminent disaster. But at the same time the digital survey is also the right base to start projecting possible interventions on the church and its mural paintings. The possibility to carry into the whole work in a very short time according to the possibilities of the digital tools, showed how a correct documentation can be done also in emergency situations allowing to preserve the status of a monument reducing the risk of its total loss.

Keywords: modeling, rupestrian, Turkey, digital survey, heritage at risk

L. BORDONI | M. COSTANTINI | A. CURCIO

A case study in archaeological documentation with ontological modelling

Documentation of archaeological and cultural heritage sites is at the heart of the archaeological process and an important component in cultural heritage research and presentation; it is an essential step without which interpretation and analysis are not possible. It is what makes archaeology and cultural heritage “scientific”. Archaeological knowledge is an important part of human knowledge and it is necessary in many applications, such as knowledge-based systems for archaeology. A formal, clear and declarative description for communicating, sharing and reusing archaeological knowledge among humans and software entities is of crucial importance. Formal ontologies have been viewed as a promising means to tackle this problem. An ontology is an explicit formal declaration of how to represent object concepts and other classes assumed to exist in some area of interest (a domain) and the relationships between them. In this sense an ontology is a specification of a conceptualization. A domain-specific ontology of archaeology is an explicit and formal specification of a shared conceptualization of archaeology, it captures the semantics of archaeological knowledge. In this work we present the use of an ontological approach to modelling and make available archaeological documentation of the Roman City of Ardea. The methodology used is summarized in the following steps: acquisition of the knowledge domain and organization of the ontological model. This ontological model consists of three major parts: archaeological categories, their relationships and axioms. It has been included in Protègè, open source platform developed by Stanford Center for Biomedical Informatics Research at School of Medicine of Stanford University. It allows to organize and catalogue information, it gives also the possibility to question the ontology using a query editor. In this paper we will present, on the basis of case study, how ontology-based approach can be used to bring benefits to the archaeological documentation because its true nat

Keywords: Archaeology, knowledge acquisition, ontology, Protègè

M. CARME

The Archaeological Map of Barcelona. Archaeology, history and heritage, from prehistoric times to the Civil War

The Map represents an inventory of the city's historical past, devised with the aim of providing a corpus of unified information that contains all the documentation on Barcelona's archaeological heritage, to create a document oriented towards the analysis, diagnosis and assessment of subsoil and built heritage. The timescale of the remains documented date from prehistory up until the Spanish

Civil War. Both the Archaeological Map and its contents are fully accessible online, and users can also download the data from Barcelona City Council's Open Data project.

A series of points regarding the Map should be mentioned here:

The adoption of standard viewing tools will make the project easy to use for everyone, including the general public.

Emphasis has been placed on facilitating the online presence of a large volume of cartographic and documentary information.

The geographical display of each intervention and the documentation available for consultation in each case are well integrated. Thanks to the fact that most of the interventions are geo-localised, geographical display has been used as the Map's main hub, which means that the user can access in-depth information using a more intuitive perspective, not only by carrying out searches with forms, but also by browsing across the land area.

A commitment to transparency and openness in documentation with respect to the general public and the scientific community. Both the Archaeological Map and its contents are fully accessible online, as well as being linked to Barcelona City Council's Open Data project.

The Map represents a new tool for academic and scientific research in the field of Barcelona's history and heritage.

One of the project's strong points is that archaeological information can be consulted on the Geoportal in a broader context that includes all the other layers of corporative geographical information. We have opted to use Google Maps, above all because it is a clear leader in non-professional geographical knowledge consultation environments, and also thanks to the huge range of display possibilities that it offers, both through the use of technologies such as StreetView and the fact that 3-D displays can be inlaid within it. However, consultations can also be made using Open Street Map, or with Barcelona City Council's plot map or its official city guide.

Keywords: Archaeological Map. Heritage, open data, city's historical past

E. CASALINI

The Umm al-Surab and Samah churches project

The Umm al-Surab and Samah Building Archaeology project aims to record through photogrammetry the sites' churches of Umm al-Surab and Samah, in the Southern Hawran area, north region of modern Jordan. The sites are characterized by well preserved ancient basalt buildings, sometimes still standing up to the second floor. Umm al Surab lies on a directory of the Via Traiana Nova, connecting the Red Sea to the Great Syria: three churches tested the importance in the past of this village, while Samah is remember through documents for having proved a lively Christian activity far more after the islamic conquest. Of the once two clearly detectable churches at Samah only one survives nowadays, while of the three churches at Umm al Surab only two have been identified.

The sites are facing today an increasing danger by the modern villages risen nearby using the ancient sites as building materials caves, by heavy restorations or negligence's consecutions. Threats even more dangerous for sites with few documentation and almost forgotten by archaeology.

The project's goal is to record the churches in order to:

- Confront and implement the previous records of the sites.
- Individuate building's techniques and reconstruct the buildings' history.
- The project uses the Zscan and Zmap softwares to generate from photos RGB eventually texturized point clouds, geometric correct Orthophotos, D.E.M. The choice of photogrammetry has proved to be the best in order to:
- Quickly record on the field of complex buildings and large areas, which is capital, given the huge amount of still standing buildings.
- Offer outputs that can be confronted and easily shared with a large public of researches.

Finally, detecting the sites in a non-destructive method means an environment-economically sustainable archaeology.

Keywords: building archaeology 3D models byzantine churches

F. GABELLONE | M. T. GIANNOTTA

“Marta Racconta”: a project for the virtual enjoyment of inaccessible monuments

As often happens, many monuments are affected, for various reasons, by an inevitable trouble: the artefacts preserved inside them until the discover have been brought into some museum, because (e.g.) the monumental structures had to be restored (in most cases with provisional works) in order to prevent their collapse. One consequence of this moving, is the de-contextualization of the grave goods and the non-valorisation of monumental archaeological contexts. An effective solution for these issues can be achieved from the use of technologies that allow the virtual enjoyment of these monuments and the virtual set-up of the grave goods in their original contexts.

This paper presents the project “Marta Racconta. Storie Virtuali di Tesori Nascosti”, co-financed by the Fondazione Cassa di Risparmio di Puglia, carried out by CNR-IBAM (Lecce, Italy) in order to provide the installation of a Virtual Platform in the National Archaeological Museum of Taranto (MARTA). The main purpose of this project is to make ‘accessible’ ancient monuments from the Greek Taras (the ancient Taranto) currently inaccessible to visitors. These are: the Tomb of the Athlete of Taranto, Tomb of the Festoons, and the Hypogeum of the Gorgons, was discovered some years ago in Via Otranto.

From a technological point of view, we have developed a Real Time 3D platform for a stereoscopic immersive visit, in which a navigation system with ‘natural interface’ was implemented, where the commands are executed with simple hand gestures. Through this technology, the visitor will have the opportunity to follow a path of integrated knowledge starting from heterogeneous contents, which will allow the access to historical and archaeological data, the archaeometric analyses and the spatial navigation within a hyper-realistic environment where it will be possible to interact with the three-dimensional structures, to query the Database and to explore, interactively, the funerary finds.

Keywords: Virtual, inaccessible, 3D, funerary

P. FERSCHIN | I. KULITZ

In the Shadow of the Pyramids – Digital Exhibition Objects

Celebrating the 100year Anniversary of the Austrian Excavations in Giza, the Kunsthistorisches Museum Wien curated a special exhibition about this event, providing insights into the civilization of Ancient Egypt and documenting Austria's seminal role in researching the Old Kingdom.

From the early phases of planning for the exhibition, digital presentations were meant to be an integrated part of the display concept and had the goals to create a contextual framework for the exhibited objects, to sketch the development of the necropolis of Giza at three different time-frames – its development in the Old Kingdom, the time of discovery and the present day situation. Additionally our goal was to give an impression of the everyday work of the excavators at that time and compare traditional and modern documentation technologies.

Beside of digitizing of the original documentation from that excavation (sketch books, photographic images) various 3D reconstructions were created – several phases of the development of the cemetery of Giza and a prototype of a Mastaba-tomb. Complementing the historical documentation, plans, maps, photographs, aerial images and terrestrial laser scans were used additionally to achieve the reconstruction. Fruitful discussions with the egyptological curators of the exhibition were aiding the reconstruction process.

This work will present the underlying ideas and concepts from the planning to the realization of the digital presentations of the above mentioned exhibition. As the digital artifacts should be integrated into the permanent collection about Ancient Egypt, it was necessary to consider different display contexts.

On the technical side, state of the art interactive presentation methods allowed to perceive information at different levels, depending on personal interest and on background knowledge.

Keywords: Digital Exhibition, Archaeological Reconstruction, Egypt, Interactive Presentation

M. MONTI | G. MAINO

Virtual restoration hypothesis for some mosaics found in Piazza Anita Garibaldi, Ravenna, Italy

During the excavations carried out in summer 2011 by Hera (a multiutility company that deals with the management of water, energy and waste in Emilia Romagna, Italy) in Piazza Anita Garibaldi in Ravenna for the making of new underground waste containers for the separate collection, five rooms decorated with mosaic floors were found, probably dating to the early Roman Empire (I-II century A.D.). The mosaics were removed for restoration and musealization, however - given the size of the gaps – it would not be possible to reintegrate them in a traditional restoration without creating arbitrary reconstructions. For this reason we opted for a digital reconstruction of the gaps, making some virtual restoration hypothesis for the recovered mosaics; in this way it is possible to grasp the trend of the figuration how it could have been in the past. Use has been made of advanced image processing techniques and of open-source software in order to verify the feasibility of this approach

h to the documentation of mosaics and their study with suitable hypotheses of virtual reconstruction and 3D simulation of the home environments. In particular, digital images of mosaics have been processed to improve their quality and to allow comparison with the physical restoration, then

corrected for geometric distortions and completed according to the sizes of the rooms and the fragments of the decoration also found during the excavations.

Keywords: mosaics, virtual restoration, open-source software, image processing

M. PUCCI | G. VERDIANI

SFM digital survey and modeling for the Museum of the sculptures of the basilica of St. Silvestro, catacombs of Priscilla in Rome

The basilica of St. Silvestro, at the catacombs of Priscilla in Rome it's a recent construction, it was built in the early XX Century, but it was realized over the foundations of a structure developed in different times during the Late Antiquity. It is now at the end of a meaningful restoration. The South-East part of the original building was conceived as a space for burials. Currently this area is used as storage for the archaeological materials found during the excavations of the past century. The new museum of the sculptures will contain 405 pieces of sarcophages dated between the beginning of the III Century a.C. and the first half of the IV Century a.C. One of the most important pieces in this collection is a well preserved marble sarcophagus, dated around the III Century a.C., graven with scenes from the everyday life and from agriculture and sheep-farming activities . This piece is the object of this study, a robust challenge for the digital survey, because of the c

omplex characteristics of the sculptures and their small size details and last but not least the difficulties linked to the light subsurface dispersion of the marble. For these reasons the survey was based on the Structure From Motion process, operating using a digital SLR camera and a specific SFM software. The main vantages of this choice are the reduction of the instrument costs and their practical management: all was done with a good quality camera, a tripod and some studio lights, while a single, middle price, software was used to produce the final digital 3D model. The final results, edited and optimized in different solutions for multimedia presentation and prototyping were soon ready for further usage, like the implementation in the multimedia detail database, right now under development.

Keywords: sarcophagus, 3D modeling, photo-modeling, database, Structure From Motion

F. U. SCELZA

The documentation of archaeological data: problems in modeling the spatial, temporal, and typological dimensions

The paper describes a proposal for modeling the spatial, temporal and typological dimensions of archaeological data. The proposal is developed on the basis of a formal approach. That is to say with the aim of building a coherent system, complete and multi-level, where the archaeological sources are classified according to stable principles and led back to unifying concepts, able to meet the degree of distinction of the material evidence. Each source is a testimony of an activity localized in one place, in a time and according to a function. These dimensions are not unique. They generate a non-linear function of three related variables. The result of this function is the landscape (urban or rural): a portion of space, anthropized, and historically determined. The problem concerns the need to unify the various available sources, bibliographic, archival, systematic, unsystematic, relating to any type of discovery. The system, that I propose, consists of a portion in which are developed the logical and functional constraints of the data, in the form of database, and of an operating GIS environment, made

up in 4 coordinates, 3 for space and one for time. The system is built with the purpose of analyzing the spatial distributions, through time, of human activities and to document the variability. It is a structure that represents and analyzes the chronograph (time, date, etc.), the spatiality (location, size, morphology), and the functionality of archaeological finds. Moreover, since each entity recorded changes in shape, size and location, it has a beginning and an end, varied role, nature and behavior, the system was created to manage such an order of mutability. The system was tested during a PhD thesis about the study of population dynamics in the Archaic period in southern Italy.

Keywords: Spatio-Temporal modeling; GIS; Database

H. THALER

Towards a Semantic Archaeology

During the last few years there have been many reports and discussions about the development and application of new technologies. We should now be thinking about steps involving the use of new internet technologies to manage and publish archaeological data on the web. The internet is changing: after internet 1.0, static web content, internet 2.0, social networking and of web site interactivity, things are developing towards internet 3.0, also defined as the semantic web. This involves an extension of the role of recognizable and unstructured information via logic criteria such as ontology, the definition and categorisation of an object in its environment, and annotations, the processing and comparison of content-based data on the net. For archaeology, this means the creation of a system of concepts with associated (scientific) taxonomy systems. This requires a common communication platform. There are some database-style CMS frameworks, but these should meet some basic requirements: the integration of geographic and GIS databases in order to be able to create interactive portfolios (interactive shift schedules with corresponding features and finds databases) geocoding, interactive management of all created media and texts, excavation teams with images creating an e-publication, blogs, forums and much more directly on the Internet, but also on local computers. This would enable the dynamic comparison of finds and typologies between excavations in real time.

The basic requirement is for completely free downloadable open technology from the web. I would like to discuss the possibilities of using the software complex Drupal <https://drupal.org/> (approx. 2000 flexible sub-programs) which would allow joint distribution in order to promote higher-level semantic dialogue. It is no coincidence that financially powerful institutions that could afford to pay for expensive applications use this free framework. To give some examples: government institutions, such as the White House (www.whitehouse.gov) specifically President Obama, newspapers, museums, libraries, universities such as Harvard, non-profit organisations such as Greenpeace, technology companies and many others.

Keywords: Semantic archaeology, drupal, semantic internet, ontologies, annotations

T. THEOHARIS | G. PAPAIOANNOU | K. BJØRLYKKE | Ø. EKROLL | D. RIEKE-ZAPP | A. LEIN | A. ANDREADIS

Multi-scale 3D Digitization at Nidaros Cathedral: from archiving to large-scale Visualization

3D scanning in cultural heritage (CH) is used in most cases either for the faithful generation of digital models of CH objects or for visualization purposes. In this paper, we move a step further and

concentrate on documenting the requirements and our experience in 3D scanning for alternative CH application scenarios, where digitization is not the end product, but rather the means to augment the existing information and acquired data. In our work, which is part of the PRESIOUS EU-funded project, we aim at utilizing and inventing new methodologies and technologies for the prediction of geometric information on CH data, ranging from the digitization process itself to geometric reassembly, shape prediction and simulation/prediction of monument degradation. To this end, the scanning requirements of the different processing tasks are given, including specialized high-definition scans for erosion measurement, mesoscale digitization for reassembly as well as for the visualization of the results. Important practical lessons are drawn and the actual digitisation pipelines of state-of-art 3D digitisation technologies are given. A practical discussion summarizes our multi-scale digitisation experience (giving the accuracy, required time and resulting data size that we observed), mainly drawn from the digitization activities at the Nidaros Cathedral, Trondheim, Norway.

Keywords: 3D digitisation, multi-scale, cultural heritage

I. TRINKS | A. VLACHOPOULOS | et al.

3D digital documentation of the ancient town of Akrotiri on Thera/Santorini

Archaeological excavations at the site of Akrotiri on the island of Thera/Santorini have revealed a unique Bronze Age town including houses standing up to four storeys high. While most of the prehistoric town is still covered by volcanic ash and pumice, a dozen buildings have been excavated and made accessible to visitors. Akrotiri is a Greek Bronze Age Pompeii threatened by destruction through earthquakes in this seismically very active region. Accidents and gradual decay cause damage to the exceptional ancient architecture. For safekeeping of this important cultural heritage site for future generations the entire site was digitally documented in February 2013 with support of the National Geographic Society and Riegl Laser Measurement Systems. Using two Riegl VZ400 scanners placed at some 850 scan positions a detailed digital model of the site was generated. Additionally, several thousand photos were systematically taken for the image based (structure from motion - SfM) generation of a digital 3D model of the site in general and Complex Beta and the House of the Ladies in particular. By combining both the active laser scanning and the passive SfM methods it was possible to cover the entire site. The project's goal is the generation of a complete photorealistic, detailed digital copy of the excavated archaeological site for digital safekeeping, archaeological and architectural research, as well as the generation of scaled real and virtual site models. In regard to the huge number of data recorded and images involved the project is unprecedented and challenging. The project team consists of Immo Trinks, Geert Verhoeven, Matthias Kucera, Erich Nau, Christopher Sevara, Wolfgang Neubauer, Christos Doulas, Andreas Vlachopoulos, Kallirroi Palyvou and Mauricio Forte.

Keywords: Laser scanning, Structure from motion, digital documentation

Laser scanning of translucent objects – development of a coating technology for historic marble monuments

A terrestrial laser scanner uses laser light to measure the distance to an object and results in a 3D scan of the object. The best achievable accuracy (in the range of a few millimetres) generally depends on the surface and material properties of the object. Common materials for historic monuments are marble or alabaster. These mono-mineral, crystalline rocks are translucent to some degree, therefore the laser light reflects not only at the surface but also at a deeper level within the object. Current laser scanner systems cannot differentiate between signals reflected at the surface and internal reflections. This results in a systemic measurement error of 1 to 4 cm beyond the real surface, depending on the material of the object and the scanning system used.

Scans of plates of marble with different grain-size and crystalline structure show undulating surfaces depending on individual structures. No standard procedure can be used to correct the measurement error.

We developed a coating technology as a solution to this problem. The coating reflects the laser at the surface, which completely eliminates the systemic error. The coating is non-destructive and completely removable. It fulfils the regulations for monument preservation. Various suspensions, composed of mineral pigments (size 1-5 micron) and water were tested. The best measurement results were achieved using talc.

A final test under real-world conditions was conducted in the park of Schönbrunn Palace, Austria. Opaque reference targets, which do not show any measurement errors themselves, were mounted on a sculpture. Scans without coating show discrepancies with up to 2 cm w.r.t. the reference targets. If object and targets are covered by talc, no such difference can be measured.

Keywords: 3D documentation, accuracy, 3D modelling, sculpture, crystalline rocks

Session: Documenting the Dead: archaeological anthropological and forensic recording of human remains

(Chairs: D. BIBBY, Germany | A. DEGRAEVE, Belgium)

Optima philosophia et sapientia est meditatio mortis

Last year's session "Archaeology of Human remains – Burial Archaeology and Forensic Aspects" showed the potential of a forum where archaeologists, historians, fieldworkers, anthropologists and forensic scientists all come together to consider aspects of dealing with the dead common to all those disciplines. The exchange of methods, ideas and experiences proved fruitful to all present. It is therefore appropriate to continue this theme into 2013.

Papers concerning the archaeology, anthropology and forensics of human remains are invited.

Subjects may include burials rights ranging from prehistoric through to modern times: Stone, Bronze or Iron Age practices, Roman or medieval burials grounds, church crypts, modern municipal cemeteries, Mass graves of warfare or genocide, experimental archaeology, studies of taphonomic processes as well as forensic reports, modern or historical disaster or crime scenes and/or traumatology serve as examples.

Special skills are expected of those dealing with human remains. Removing human remains from their “last resting place” has its own set of specifics calling not only for the appropriate respect in interaction with the “objects of interest” themselves but also for sensitive relations with all involved, however marginally. It is essential that all forms of interment are documented and treated correctly on site at the point of discovery and during further processing, should they realize their full information-potential for investigations in the fields of physical anthropology, histology, radiological investigations, ancient DNA, trace element and stable isotope and chemical analysis etc.

Documentation is this year’s main theme. The focus will therefore be on the documentation of human remains. Specific documentation approaches tailored to addressing specific problems will be welcomed as will contributions describing the advantages of modern methods such as photogrammetry, SFM-techniques and various scanning or computer tomography techniques. Even well founded studies advocating “traditional” recording as the ultimo ratio for burial archaeology despite the widespread and ready availability of high tech methods are also of potential interest.

D. BIBBY | R. RÖBER

Some New Angles: The excavation, documentation and analysis of the “Lower Minster Cemetery” in Konstanz

During the extensive excavations of 2003 – 2007 to the north of the Minster in Konstanz, famous for the final and irrefutable discovery of extensive and substantial Roman architectural remains, 145 medieval inhumations of the “Lower Minster Cemetery” were also uncovered in layers overlying the Roman and Iron Age phases. Due to the structure and character of the redevelopment which the rescue dig preceded, the depth of excavation varied across the site. It must therefore be surmised that the burials were originally more concentrated and denser than could be revealed by limited excavation. Still, the sample is good enough to show that the burials are not uniformly distributed across the graveyard. Whilst up to six overlying inhumation layers could be recognized adjacent to the Minster, the burial density thinned out toward the north and east. Even though the graves are generally east-west oriented, the deviations from this norm are so obvious that they must represent different periods of burial activity. In order to quantify these deviations the graves were divided into four “angle-groups” of 60-80°, 80-100°, 100-120° and over 120° which were then analyzed in virtual three dimensional space. This approach was made possible by the techniques chosen at the beginning of the excavation for on-site recording and documentation. The 2D digital photogrammetry and digitalization of each and every skeleton and their individual positioning in 3D space enabled 3D analysis of the stratigraphic and topological relationships both between individual skeletons, the grave “angle-groups” and the surrounding ecclesiastical buildings in various combinations, leading to interesting chronological and topographic conclusions on the nature of the cemetery.

Keywords: inhumation, cemetery, stratigraphy

A. GROTHE | B. JUNGKLAUS

Six Skeletons in the Shadow of the Garden Wall – A Berlin Medical Doctor under Suspicion

During archaeological fieldwork on the area of the so-called 'Great Jewish Courtyard' five skeletons in situ, an emptied burial pit and a single human bone were uncovered. The so-called Jewish Courtyard

is an early modern ensemble grouped around a small central yard in the heart of Berlin. Due to the fact that the French Church (consecrated in 1726) was situated only a few meters from the excavation ground, it seemed likely that the dead once belonged to the French Reformed Parish. A closer look at the Church records revealed that the parish did not possess a cemetery around its church. They buried their dead in the other three burial grounds of early modern Berlin. Furthermore there was no evidence in the records of 'catastrophic events' in the period of the Thirty Years' War, during which the inhabitants might have buried their dead within the city walls but outside regular graveyards. Finds in the pits as well as the stratigraphy dated the burials to the 2nd half of the 17th century. Osteological and traumatological examinations have been undertaken; marks on the bones indicate that the five dead once lived in poor economic conditions; moreover, two of them died a violent death. More historical research was necessary to answer the question as to why they were not buried in a regular cemetery: before the building plot for the church was bought by the French Reformed Parish in 1720, it belonged to the medical Doctor Philipp Sigismund Stosch. Over a ten year period, between 1680 and 1690, he was part of the medical staff of the Brandenburg electoral court in Berlin, working as a medical attendant. He then moved to Küstrin which was then in the Electorate of Brandenburg (today Kostrzyn Nad Odra, Poland). There he worked as superior public MD and later even became Mayor of the town. From 1698 he became a member of the oldest German Academy of Naturalists. Very little known about the ten years that Doctor Stosch spent in Berlin and any medical-anatomical activities he might have been involved in there. The five skeletons found in the backyard of his then residence, shed a rather suspicious light on his work.

Keywords: Berlin, early modern period, medical-anatomical activities in the late 17th century

R.G.A.M. PANHUYSEN | E. SMITS

Burial ritual and bioarchaeology of the De Heul cemetery of early medieval Dorestad

Early medieval Dorestad is considered to be a type-site for the Carolingian emporia and it is therefore frequently mentioned in archaeological and historical publications. Its location was known since the middle of the nineteenth century and it has been excavated systematically since the late 1960's. By now large sections of the settlement have been uncovered and the location of habitation and harbour zones is documented. The available archaeological data indicate that the site was an important centre of exchange and covered a large area. Hitherto, little was known about the nature of habitation. Questions considering the composition of the population and the health situation of the people buried at Dorestad remained unanswered. A backlog program of the Dutch Science Organisation has made resources available to study the cemeteries and human remains of Dorestad. This paper will provide an overview of the four large cemeteries that were excavated in the past 50 years. Although these cemeteries are mainly contemporaneous they differ in organization and burial typology. Based on the research of the burial contexts and the human remains in these graves the paper will focus on the osteoarchaeological analysis of the De Heul cemetery and discuss the composition of this cemetery population in relation to the nature of Dorestad as an early medieval emporium. The De Heul cemetery will be compared to other Carolingian cemeteries in Dorestad and Maastricht. As a result it will be possible to describe in what aspects the population of this emporium differs from other contemporaneous centres of exchange.

Keywords: Demography, funerary archaeology, living conditions, early medieval emporia

Session: NEWBIES

(Chairs: M. DONEUS | B. STANGL, Austria)

One important aspect of the conference „Cultural Heritage and New Technologies“ is that it brings together students, young scientists and experts and in that way enables and promotes an exchange of ideas. While the conference turned out to be a home for informal talks and exchange of ideas, it still lacks presentations from the young scientific generation.

Due to the success of the “Newbie-Workshop” at last year’s meeting, we are encouraged to proceed and to offer a similar workshop for 2013. The session wants to encourage especially young scientists to present for their first time at a conference. The topic of the presentation should be within the scope of the conference. New ideas, new ways of thinking, clever solutions, workarounds, or critical thoughts are especially welcome.

The conference organizers agreed that every presenter will get free admission to the conference.

I. BELIATSKAYA

The adoption of innovation in museum sector in Belarus: the National Art Museum case study

The museum sector has been playing an important social role in people’s community as a reference center, particularly about the past of history. In comparison to the role of tradition museum, the role of modern museums is completely different and serves more than just preserving, storing and displaying artifacts. In most developed countries such as the USA, the UK and even Australia museums have transformed significantly by adding creativity and innovative ideas such as Information Communication Technologies (ICT). The new view of heritage interpretation co-creation as a collaborative product is emphasized in the case of eHeritage or digital heritage, where artworks are generally composed and re-created by efforts of a team that involves the artists, graphic and designers and even visitors. However, a great amount of museums in developing countries are still operating using the traditional method, among them is Belarus. Therefore, there are a lot of questions regarding to t

he further method of museumification of cultural heritage in Belarus. Accordingly, the main objective of this research is to investigate the function of modern museums and analyze at the adoption of creativity in museum sector with special focus on Belarus. In order to have clear understanding and a complete overview of the current situation of innovative technologies adoption in Belarusian museum sector, content and functionality analysis was conducted. While using this research method, the author was interested in analyzing the adoption of interactive technologies in museums websites on example of National Art Museum, proposing a creation of virtual copy of this museum, referring to the best practices on creation and organization of virtual museums abroad. The author concluded to suggest allowing public to participate in the distribution and production of heritage to a certain extent while take part in the construction of the exhibitions and collections.

Keywords: digital heritage, interactivity, creativity

G. CERRI

From the traces to definition of the monumental space: the case of Bartolomeo Ammannati's "Fontana di Sala Grande"

Methodology/Approach

Art and Architecture are two meaningful parts of the humanity cultural heritage, being a product from the human artistry they are subject to the declination of the taste, of the styles, of the decisions of the historical period they belong to.

In this case study, the specific approach to the Ammannati's Juno Fountain opens the paths to a series of lectures and interpretations to clearly read the original shape and setup of an "unrealized" masterpiece from the XV Century.

The physical reconstruction, kept in the National Museum of Bargello in Florence, leave open the "mystery" about the original Ammannati's plot, the design intentions he was bringing on for the "Sala Grande" in Palazzo Vecchio.

To correctly read them and to define correct strategy of intervention the need to understand and have a clear knowledge about the contest and the studied monument is mandatory, any choice far from this will fail or in the worst situation may cause fake interpretations.

Results

The investigation will be proposed to hypothesize about this meaningful monument and its possible asset inside the "Sala Grande" before the Vasari's intervention (today it call "Salone dei Cinquecento"). The resetting of fountain involved questions about original project of south wall of "Sala Grande" that was part integrating of the Monument.

Innovations

This kind of reasoning represent an important step to apply an academic study to display matters. In fact, the part developed is peculiar for to communicate at Palazzo Vecchio's visitors that the Salone is changed and that they can find a piece of the old configuration in the Bargello.

The acquaintance on the space that contained the Fountain is important in order to understand the Ammannati's masterpiece. So the theory part is the first step to develop a Site Specific Project.

The digital modeling based on accurate 3D scanner survey allowed to use high quality models to verify and check the possible reconstructions and combinations from the single pieces to the possible original setup. The use of physical light simulation and of virtual sun positioning system, allowed the correct conditions to "see" the possible Ammanati's plots behind the "fontana di sala grande" project.

Keywords: Culture Heritage, Florence, Juno's Fountain, Bartolomeo Ammannati, Sala Grande

K. CHEW

Archaeology and Analytics: Tapping the Pulse of Social Media for Outreach, Education, and the Future of the Field

Among the various academic disciplines, archaeology is one which has held a particular romantic sway over the public imagination. Such fictional archaeologists as Indiana Jones and Lara Croft have long occupied the attention of the Western media consumer, representing archetypes of adventurers, mavericks, romantic and sexual ideals, and the relatable side of intellectualism. Myriad documentaries and fictitious works about archaeology and archaeological inquiries attest to this public preoccupation.

Yet, despite this disproportionate share of the general public's attention, it is unclear how much of this attention is focused on the fruits of academic research rather than the fruits of entertainment media. By extension, the degree to which the public understands either the discipline of archaeology as it is actually practiced or the data produced through archaeological research is uncertain. I seek to shed light on the apparent disconnect between the public discourse on archaeology and the understanding of it as held by participants in the field by examining the public discourse where it happens: in social media. Utilizing targeted data streams harvested from the Facebook API and applying TF-IDF textual analysis, I attempt to discern what differences can be found between the public discourse and that of professional archaeologists. By identifying the trends embedded in this divergence, I provide a framework within which the relationship between the academy and the outside world can be contextualized in order to more clearly assess the effectiveness of public outreach efforts and better target educational resources in the future.

Keywords: archaeology, analytics, social media, tf-idf, facebook

E. DE BENEDICTIS

Dealing with past, the Dodecanese case

Some archaeological contexts must confront with interpretation of archaeological data produced in the past. These old data sometimes carry very important information, worked from activities in the main zones of an archaeological site. A good example can be found in the archaeology of the Dodecanese. Indeed, here the most important archaeological site excavations and archaeological activities were carried during the first half of the twentieth century under Italian direction and the data were elaborated following models which were in fashion in that period. The reconsideration of these works is the main challenge for the archaeology of the Dodecanese, especially for the contexts in Kos and Rhodes where the Italian archaeologists like Inglieri, Biliotti and Maiuri were extremely active. An additional important topic is the creation of specific topographical cartography and specific archaeological charts, so far available only for the isle of Rhodes and known as "carta archeologica di Rodi". These maps created by the Italian IGM, especially the first typology which bears Italian toponyms, were used as base for chart series created by German and American army, as well as starting point for all the archaeological surveys in the archipelago, among which the work of Lazenby and Hope-Simpson should be mentioned. This paper describes a possible solution to these issues. Using the web tool "Tlfide" it is possible to link old raw data and cartography with new data and new cartography in a digital space. This action could allow a "regeneration" of the old data that could represent an important development for the Dodecanese archaeology. Specific researches in some archives (like the IGM library and the Florence museum of archaeology) will complete the "old data pool" together with old publications.

Keywords: recovery old data, GIS, web tool

A. NILSEN | M. HJERTMAN

Re-evaluating City Margins through Correct Documentation: Questions of Time, Social and Spatial Aspects in Archaeological Storytelling

Early Modern Town Project New technology offers great potential in how it may facilitate and renew the way in which archaeologists deal with the past during excavation, recording and surveying. However, the selection of base material is equally important in making an adequate analysis and presenting a fair picture of the analysed urban environment. Analyses often neglect to take into account spatial, social and chronological aspects of an urban environment, which affects our current state of knowledge of the city. A tendency in urban archaeological research is the focus on centrality. City walls or boundaries are considered to stipulate the actual limits of the city, and what is inside is normally the focus for investigation. While large areas outside the city walls were part of the city activities they are frequently excluded from cultural heritage laws. In this way, the research misses both interesting and vital parts of the urban space. The extramural area, to a higher extent, built beyond an official and regulated city plan. A large part of the city population may have lived and worked outside the city cores. The lack of archaeological excavations in these areas may lead to their stories never being told or ever becoming part of the official version of history and cultural heritage. Another important aspect to discuss is the question of time and chronology. Until recently in Scandinavia, large parts of history have been overlooked in search of more “in vogue” periods, for example the earlier Middle Ages and backwards. Cultural layers from the Late Middle Ages, Early Modern and Modern periods thus have been removed without proper, or any, documentation, affecting our analysis and vision of urban contexts. In our paper we want to raise questions of representativeness, in a way obvious, although often overlooked when it comes to investigating and analysing urban contexts. Our archaeological results may benefit greatly from new and precise technologies, but they will never be fully accurate and representative if we consciously or unconsciously discriminate and exclude certain social, spatial and chronological aspects.

Keywords: In-correct documentation, city margins, representativeness

C. SILVESTRU

The Leveling of the High Medieval Viennese City Moat - A Space Syntax Perspective

The present day street layout of the Viennese city centre roots in the urban expansion of the 13th Century. Among several measures involved - such as the erection of a new fortification ring and the inclusion of historically and economically important streets – the new urban area caused also the placing out of operation of the high medieval fortifications. The wall dates back to the roman period of Vindobona and was restored in the 12th Century by the Babenberger dukes. After becoming obsolete, the wall was partly incorporated between new houses as a fire-proof-wall and partly demolished. Nevertheless the rough course of the roman respectively high medieval wall is easily identifiable both in the late medieval and the present day urban layout.

This paper will focus on the consequences on the overall street pattern that were introduced by the placing out of operation of the high medieval fortification and the leveling of its moat. In doing so, it will apply space syntax analysis methods to a new reconstruction of the plan of late medieval Vienna. The Space Syntax Theory was developed in the 60s by Bill Hillier in order to link urban patterns to social behavior and human movement. The employment of Space Syntax Analysis will point out the change of integration and centrality within the urban fabric caused by one of the most meaningful interventions in Viennese urban history. It will also depict the expansion process within the high medieval city and

illustrate the meaning of distinctive areas such as the one around the church of St. Ruprecht or the main square at Hoher Markt.

This paper is part of current PHD-research on the urban development of medieval Vienna and new means of interpretation and presentation of the medieval Viennese cultural heritage.

Keywords: medieval city development, movement patterns

T. USAMI | T. UNO

Combination of Different Methods for Archaeological Documentation and Data Integration: a Case Study of Dabusia tepa in Uzbekistan

The international research project, which is a co-operation between the Japanese research group of archaeology and Institute of Archaeology of the Academy of Sciences of the Republic of Uzbekistan (project leader: Prof. Takao Uno), has been involved in the diligent excavation and continuous documentation of the archaeological site of Dabusia Tepa (Uzbekistan) since 2005. In this presentation we will begin by giving the overview of the results of the project. Then, to take an example of our approaches, we shall provide a detailed account of the methods for the digital documentation of the huge wall of the excavation site, finds, the land-forms, etc. They are composed of the combination of different techniques, and were practically used for this year's research. In addition, on the basis of proceeding with such technical procedures of documentation, we also introduce the result of simulating the dynamics of the flood plain that have had the great influence on the existence

of the site. Finally, the presentation intends to demonstrate the way of integrating the spatio-temporal information extracted from the captured archaeological data set to construct an explanatory model that can help us understand historical (or the past and the present generations') knowledge.

An archaeological site (cultural heritage) has been taken over from generation to generation up to now with its significance changing each time, and could be regarded as an dynamic entity composed of the different generations' knowledge involved with it. While there is much work ahead, according to this point, our work above concerning the way of extracting useful information from archaeological data and integrating/analyzing them as an entity can be valuable. However, all data, techniques, instruments, etc. (or a series of procedures) for documentation are deeply rooted in our own knowledge (bias), and this fact reminds us of much difficulty with documentation. The presentation will also review this kind of issue and a future prospect.

Keywords: Documentation, Data Integration, GIS, Dabusia tepa

Session: Archaeology goes multimedia. Frontiers of dissemination for presentation and learning

(Chairs: A. M. JASINK, G. VERDIANI, Italy)

This session is aimed to collect paper proposals about research and operative experiences aimed to produce medium or large archives organized in the logic of the public presentation and/or interaction, there will be two main categories we would like to emphasize in this session:

1) The archives with public access useful to contribute to new and web based research, from those oriented to the scholars to those which are thought for the newbie.

2) The learning and didactic presentation of archaeology contents in order to enhance the educative process and to allow a better understanding of historical and ancient events and of the way of living in the past.

Particular importance must be given in the description about how the base data are used and made available and what kind of interaction is supported between them and the users. At the same time it is suggested to underline the relationship between the presented project and the main international tools for dissemination/consultation, like Wikipedia, Google Earth, Europeana, just to mention the most well known. At the same time for the learning and didactic project a clear description of the users chosen as target of the project will be welcome.

The main scope of this session will be to spot over the way a large amount of data, correctly archived, can become a learning and a study tool thanks to an approach based on “correct documentation” criteria with robust solutions and advanced approaches.

N. ALBERTINI | A. M. JASINK | B. MONTECCHI

Digital acquisition and modeling of the Minoan seals and sealings kept in two Italian Museums

Seals are small semi-precious or common stones cut into standard shapes, polished and engraved with ornamental patterns. Sealings are small clay lumps impressed one or more times by seals and occasionally inscribed. In the Minoan Palatial administrative system (First half of the II Millennium BC) some types of sealings were used as receipts or tokens to check incoming and outgoing of commodities, other types were fastened to commodities and/or to documents written in perishable material as labels. A selection of Minoan seals and sealings are currently housed in the Archaeological Museum of Florence and the Prehistoric Museum Pigorini of Rome. Almost all the sealings kept in these two museums come from the site of Haghia Triada (South-Central Crete), the only exception is one from Zakros (Eastern Crete), for a total of 40 pieces. All are dated to the Neopalatial Period (around the XVI cent. BC). Neopalatial sealings are grouped in four main types, which are all represented in

the Italian collections, apart from the roundels. We intend to elaborate 3D models of the most representative and best preserved seals and sealings housed in the two Italian Museums with the aim of applying a multidisciplinary methodology designed to develop solidly based hypotheses on the use and function of such items. Sealings show different shapes and bear various signs and traces on the clay, which can be valorised in the 3D models. Finally, we intend to show a brief virtual simulation of the suggested scenarios to verify the verisimilitude of the elaborated hypothesis. In other words, we intend to operate an update of the traditional practices of experimental archaeology, with the technical assistance of a specialist in 3D laser scanner survey applied to cultural heritage. Therefore, the present contribution is aimed at integrating theoretical and “experimental” studies, conducted with updated technical.

Keywords: minoan seals, 3D Models, Archaeology and Phylology

G. ARENA | V. PAGLIARULO

The museum between real and virtual: fruition of holographic projections for museum education and the role of digital holography for “Real 3D” imaging systems.

The museums should be able to reconstruct, with the help of appropriate teaching materials, the connective tissue to which the objects in the museum once belonged. In such situation the replication and contextualization of three-dimensional holographic images of artworks play an important role. They can provide real added value creating museums composed of both real and virtual objects, allowing for example to bring together fragments which has been separated physically or historically (think on collections of dismembered artworks in museums very far apart) or making available the reserves of “hidden” works, housed into deposits of the museums. Applications of holography to museum practice seem to be rather promising. Holographic methods may be a means capable of significantly raising and improving the state of technical equipment of present-day museums, being able to create “real 3D” images. Nowadays, in a number of museums, are presented projections incorrectly labeled as “holographic”, being instead 2D images displayed onto special semitransparent screens. To achieve real 3D display, the emerging Digital Holography (DH) techniques offer new perspectives for future museum applications, in combination with current multimedia systems. History of holography and reconnaissance current about using of holography in the museum, current state of the art;

Methodology/Approach: Motivation and examples of museum applications of holography (for example the museum of Tripoli (Libya) and Eskisehir Archaeological Museum (Turkey), the Virtual Archaeologic Museum (MAV-Ercolano-Italy).

Results: Identification of Digital holography features for display applications in the museum .

Innovations: Infrared Digital Holography for cultural heritage (An experimental setup developed by INO to make digital holograms in the infrared (this technique allows the creation of holograms for large statues and archaeological finds).

Keywords: museum education, digital holography, fruition of artistic and archaeological heritage

L. BOMBARDIERI | A. M. JASINK

SHERD (Secure Heritage, Exhibition, Research and Didactics). Towards a DigiDactic Museum

Where Digitization meets Didactic, “DigiDactic Museums” creates a new border crossing, definitively leading to challenging exhibition platforms strongly oriented towards education and e-learning. New research trends and data capture procedures are currently spreading, with the aim at strengthening and updating potentialities and performances in museum collections exhibitions. Furthermore, advanced e-learning platforms are demonstrating further positive applications and a clear appeal for students/visitors interested in museums collections.

SHERD aims at developing a new Museum DigiDactic project specifically addressed to the audience of University students in Archaeology and Ancient History.

SHERD Project is based at Aegean Lab, SAGAS-UniFI, where a complex new interactive museum exhibiting archaeological ceramic collections from Bronze Age Aegean and Cyprus is presently under construction. As a whole, SHERD extends use and potentialities of didactic tools already tested within MUSINT Project, focusing upon a semi-specialized audience of students.

While support materials will be available (e.g. historical and archaeological overviews on specific topics, in-depth descriptive analyses of main aspects in the production technology), an open filing

system will also be planned. Logged users will be authorized in contributing to the on-line collection catalogue, which will be a dynamically implemented system with free access to students.

Furthermore, SHERD Catalogue of Aegean and Cypriote Ceramic Collection will be opened and visitors will be permitted to freely use the entries that are available on the interactive museum system. As already positively tested in several parallel cases (e.g. Ancient Cypriote Collection at the British Museum, London), logged visitors can eventually use images for private purposes in education, teaching, academic study and research, publishing images in a book, article, thesis or booklet, provided that the publication is non-commercial in purpose, and has an educational, scholarly or academic nature.

Keywords: Interactive museum; Aegean and Cypriote Bronze Age; Didactics

A. BRAGHIROLI

The fragment collection at the Museo Archeologico in Florence, Italy: building a virtual model to extend its access

The subject of the project is a remarkable collection of ancient fragments currently located in a courtyard of the Archeological Museum in Florence. The site includes fragments from many different areas of the city at the age of the Roman empire. Nevertheless its unique archeological value, currently the courtyard cannot be visited, because it would require too much effort for the museum to make it accessible. The objective of the research is to make the entire collection available for virtual visiting through a digital model, both in an online and offline scenario.

A laser scan survey was already available from an extensive survey of the whole area, but the resulting pointcloud data was too big to be easily managed and converted to a 3D model suitable for real time rendering.

For this reason I focused on a small portion of the courtyard, a small temple shaped artifact made of fragments from the ancient Isis temple. A photographic survey was made with non professional equipment, in order to keep the entire workflow simple and extensible to the whole courtyard.

Then all the photos were processed by two different softwares, then the resulting 3D meshes were compared to the original pointcloud in order to check reliability and integrity of the 3D model.

The more accurate model was then refined and optimized for real time render, decreasing the faces count and including extra detail in the texture data.

I designed an online interface, that could easily allow virtual visit through a website, displaying extra information about each fragment. Also a more detailed model was set for an offline scenario (a kiosk placed inside the museum), using a powerful realtime render engine usually designed available for video games.

This approach can be easily extended to the whole site in a low cost survey scenario.

Keywords: digital survey, laser scanner, 3D modelling, museum, virtual model

G. DIONISIO | D. LICARI

Silvered Ceramics in the National Archaeological Museum of Florence: Virtual Technologies in Analysis and Restoration

The National Archaeological Museum of Florence has in storage a batch of about 50 ceramic silvered vessels of Etruscan production (late fourth and early second century B.C).

Silvered vessels were a production decorated in relief and coated with a white-grey film to reproduce the effect of a silver surface. This factory was intended for funerary matters and for a low cost imitation of tureutics.

Damaged by the Florence flood of 1966 and by old restorations, this Florentine collection has never been studied and shown to the public. In this ambit, Dr. Dionisio is developing a PhD project at the University of Florence with the purpose to study, preserve and restore this collection through diagnostic analysis and modern restoration techniques.

Within this project, the collaboration with DREAMSLab (Distributed Research Environment for Advanced Modeling and Simulation Laboratory) at the Scuola Normale Superiore of Pisa is particularly interesting.

Thanks to the support of Dr. Licari, three silvered ceramics of the Florence Archaeological collection have been selected for pilot applications: for one of these a screen will be developed to study the performed analyses in a virtual environment; for the second, a model of surface reconstruction has been devised and for the third, a virtual restoration is under construction.

The applied techniques will allow a direct visualization both of the first diagnostic tests applied to the artifacts and of the reconstruction of the complete surface coating using 3D technologies and virtual reality application.

The virtual restoration is a very useful application in the planning of a subsequent restoration project. We would like to reconstruct virtually an ancient Etruscan vessel and print it in its entirety through a 3D printer. The printed model will be used and enriched by an augmented reality application that integrates tactile sensations to levels of virtual information.

This contribution aims to outline the advantages obtained by the application of virtual techniques to this archaeological research. The combination of science and archaeology is now increasingly necessary to understand, study and convey to the public the various aspects of ancient societies.

Keywords: ceramic, virtual environment, 3D technologies, virtual restoration

F. GABELLONE | D. TANASI

Virtual Archaeology and Historical Revisionism. The neglected heritage of Greek Siracusa

The Sicilian case of Siracusa is emblematic. Founded by the Corinthians in 733 BC, birthplace of poets and thinkers as Epicharmus and Archimedes, visited by many prominent figures of Greek culture as Pindar, Aeschylus and Plato, Siracusa over centuries became one of the most beautiful, influential and wealthy among the Greek cities of the Mediterranean basin, as the majestic temples testified. Nonetheless, regardless the historical background and the imposing visible remains of that past emerging everywhere in the actual urban area, Siracusa, since 2005 World Heritage site, has never played the role of quintessential archetype of Greek city both in the scientific literature and the mainstream.

Against this scenario a proper action of historical revisionism over all the media should be undertaken for recovering the neglected heritage of ancient Siracusa in order to retribute to this once splendid

archetype of Greek culture the deserved role in the international Mediterranean network of classical archaeology key-site.

A starting point is represented by a virtual archaeology project, undertaken by a team of scholars of the IBAM-CNR and The Arcadia University - TCGS, aimed to the overall digital reconstruction of Ortigia, the core district of the Greek Siracusa, produced a 3D documentary 'Siracusa 3D reborn', that represents a pivotal advance in the knowledge of the Greek background of the city.

In this perspective, the choice of providing 'passive' cognitive tools embedded with communicational and emotional components did not affect the scientific accuracy with which the reconstructive process has been carried out. Main monuments of Ortigia are described and analyzed in the context of a full 3D stereoscopic representation employing techniques of modern cinema industry for elucidating and explaining its historical and archaeological characteristics. The reconstructive workflow followed a meticulous methodological plan based on the published data and aimed to define a previously unavailable topographic profile of the city, portrayed in two main chronological phases, Archaic and Late Classical.

Keywords: Siracusa, 3D, Reborn, Virtual

A. MERLO | G. LAVORATTI | A. ALIPERTA | F. FANTINI

The fortress of Pietrabuona: image based models for archaeological dissemination

The subject of this paper is the ancient church of San Matteo, built in the medieval settlement of Pietrabuona (Pescia, Pistoia, Italy).

This ancient building was founded in the XI century and has been transformed into a fortification in the XV century, during the battles between Pisa and Florence, but since then it has been abandoned and reduced to ruin.

The elaboration of data obtained thanks to a digital survey and the interpretation of such information done by a multidisciplinary research staff have made possible not only the analysis of the typological distinctive features of the church, but also the analysis of the executive criteria and stylistic elements that characterize the building.

The 3D models are gradually becoming an essential resource for those who are working in the old heritage field, because they introduce new potential uses in the dissemination and preservation: they can be seen as holders of a variety of data (metric, materic, static, historical data, etc.).

Starting from laser scanner data and through more and more refined optimization procedures, it is now possible to obtain a 3D representation which has greater metric and perceptive reliability, if compared to a significant reduction of hardware resources necessary for the visualization.

Once a high detail model is well-defined (high-poly), the pipeline presented in this study case allows to create scale models with simplified geometry (low-poly), using reverse modeling process and modeling techniques taken from the entertainment field. These models, conveniently mapped with normal/displacement maps and diffuse color textures, are characterized by a high perceptive fidelity and can be easily visualized on laptops, tablet and smartphones, not to mention that they are enriched with information that can be extremely useful for the analysis of the building.

R. MIRIELLO

Electronic Resources of the Riccardiana Library of Florence. Legature on line

The Riccardiana Library in Florence is a relevant institution in the panorama of Italian libraries and has a leading position in the strategies of archaeology of written documents. The research projects of the Riccardiana Library are particularly concerned with conservation, restoration and availability of the cultural heritage book, with full exploitation of electronic resources.

Legature on line is a project in progress, with the aim of cataloguing the manuscripts of the ancient ligatures. In the final phase it will include the description of 320 intact or restored units, until the end of the XVI century, and also of some valuable pieces of the beginning of the XVII century.

To ensure a friendly consultation, usable also by non-specialists, the mask is structured according to a plurality of fields of access to documents, identified by location.

Next to a double possibility of view of the card of each manuscript (presented either in a descriptive shape or trough lemma), the scanned image is flanked on the move, with the option for the user to rotate the object to a three-dimensional view and to enlarge the individual details of the decoration.

The site makes a useful glossary of technical terms available.

Keywords: legature

E. PENDER

From fieldwork archeology to large scale presentation

This proposal focuses on two main projects, from raw archeological data management, analysis and distribution to large scale presentation of scientific research information to the international public.

The Koiné-GIS project, developed with the University of Perugia, is a complex digital system based on cartographical information that will allow the interaction of archaeological, architectural and geological data collected in single geographical areas. The first two testing sites presented are Pompeii for vertical stratigraphy, construction techniques and single domus and Fregellae for public structure analysis and archaeological materials.

The Digital Museum Introduction System is instead a multimedia project developed to enhance historical and archaeological learning for tourist and worldwide visitors of museums and archaeological areas through modern and innovative digital creations that combine different 3D virtual technologies with film making methodology. The perfect combination of virtual reconstructions, camera projection, imaging restoring and touchscreen software development allowed the creation of different stand alone modules that work together as one complete learning system whose main purpose is to excite and educate regardless nationality or knowledge of the classical world.

Keywords: 3D Virtual, complex GIS, digital learning

C. SILVESTRU

Digital Documentation Platform on the Medieval Urban Development of Vienna

The essence of the city lies in its coherence. Therefore urban history research examines the relation between different stages of development of the city, between several scales of urban structures as well as between the different media (text, image, architecture) which store information on a city's history. The analog publication medium implies a linear structure and hinders the readability of data

across multiple development stages and urban scales. Further, the scientific publication limits the dissemination of information by addressing mainly a professional audience. In order to attract other target groups, such as residents or visitors, it lacks the dynamism and interactivity to which the consumer aspires. Digital media can comply with these requirements and offer cross-linked data through timeline-navigation, reconstructions of city layouts and access to requested detailed information. The direct switching between contents and the constant availability of information transform the documentation of research in an accessible and traceable base for further projects. The paper at hand presents a digital documentation platform which relates the current state of research on medieval Vienna to new reconstructions of the historic urban layout and allows a free, non-linear navigation through the content. The graphical framework - the reconstructed city plans – is based on the overlay of existing punctual research results on the urban development of medieval Vienna with the information content of historical maps and the preserved medieval architecture. The documentation platform provides a solid extensible base for research on medieval urban history, at the same time making knowledge on Viennese history attractive to a wide audience and stimulating the examination of the touristic potential of the medieval architecture of Vienna. This paper is part of current PHD-research on the urban development of medieval Vienna and new means of interpretation and presentation of the medieval Viennese cultural heritage.

Session: Authenticity in the Archives

(Chair: R. GÖLDNER, Germany)

In general "authenticity" means "vouched, genuine". In the field of classic archiving authenticity describes the fact, that the archived documents or objects remain original, unchanged and undamaged. Jenkinson* described the task of archiving as "to hand on the documents as nearly as possible in the state in which he received them, without adding or taking away, physically or morally, anything: to preserve unviolated, without the possibility of suspicion, every element in them, every quality they possessed when they came to him". So it is one of the most important criteria of quality in archiving.

"What does "authenticity" mean for archaeological archiving today?"

What does "authenticity" mean in the digital era? Compared with classic archiving some specific questions arise, e.g.:

- Is a digital copy equivalent to the original document?
- Will anybody be able to open and use an unchanged and undamaged (authentic) document after some hundred years? What story can it tell then?
- How do modern methods of archiving digital data (e.g. migration) affect authenticity of documents?
- Would it be authentic to open an old document with new software or with an entirely new computer system? Which kinds of presentation are authentic?
- What about complex digital data with integrated functionality (such as databases or geodata), how can we preserve authenticity of these functions?

Authenticity is closely connected with long term preservation of digital data. Already much information on this topic is available. Even standards have been established, such as ISO 14721 (Open Archival Information System) and DIN 31644 and DIN 31645 (digitale Langzeitarchive). But how far does practical experience exist? Are there systems that implement those standards in practice? And how do these systems deal with authenticity?

Authenticity also plays a role outside archiving. It is common practice to publish data via web services, e.g. geodata services. Such services can be flexibly used within various applications and they can interact with the data within these applications. But if the presentation of that data can be freely modified, where is authenticity?

This session addresses the following questions:

- Which criteria are important to preserve authenticity in an archaeological context?
- Which conditions, which means and methods, which information is/are required to preserve authenticity for the long term?

Contributions discussing the question of authenticity and connected themes in the archaeological archive - both traditional and digital - are welcome.

Reiner Göldner

(With the friendly assistance of David Bibby)

* Jenkinson, Hilary: A Manual of Archive Administration. London, 1965.

D. BIBBY | R. GÖLDNER

Authenticity and Functionality at Digital Archaeological Data

There is no way around it, archaeological information has to be archived in digital format. Excavation reports, context descriptions, photo documentation, excavation drawings, maps of find spots and monuments, 3D scans... Data are created digitally with increased regularity. They are stored less and less often as analogue copies on paper or film in filing cabinets, boxes and sleeves - indeed, for some data it is impossible, difficult or even makes no sense to create analogue copies. Digital data provide many more possibilities and more functionality than analogue data. But how far can we trust in digital data, Are they "true"? Are they authentic after years and years?

Using the classical concept of "authenticity" in the digital domain, there are some problematic aspects: A digital object can be cloned - so which one is the original? What about changed system environments and changed presentation software? What about data migration to newer versions of data formats? What about integrated functionality?

So it is clear, that an unspecified, absolute authenticity cannot be achieved while archiving digital data. But what can be achieved? The paper discusses some thoughts and concepts on digital authenticity and illustrates some aspects that may help to preserve digital authenticity over years.

Keywords: authenticity, digital archive, archaeological data

G. HAUSAR

Discarded Toys - Excavating, Documenting and Reviving Abandoned Digital Games

Games have accompanied Civilizations throughout history. Besides bringing tremendous joy while growing up, the act of playing games with toys is closely related to the development of social bonds, teaching necessary skills and slowly familiarize children with the complexity of life. For later generations, historical toys offer valuable insights into the reality as it was perceived then. This is also true for digital games, who have been sadly neglected for the most part.

The difficulties when documenting digital games arise with the medium. A game that could be played on a certain machine more often than not was not easily converted to the next generation of processors. As the innovation cycle was very fast, a new generation of personal computers was available roughly every 6 month. This lead for example to some machines having a dedicated turbo-switches installed, so "old" programs could still be run at the slower speeds. These examples showcase some of the difficulties digital archeology and preservation efforts have to overcome. Documentation thus not only needs the specific game, but access to a fully functioning machine to run the program on. As there are only a few "official" institutions preserving historic machines in a state that allows digital archaeologists to run programs on, a huge network of dedicated private institutions, persons and enthusiasts stepped in to help with the documentation efforts: games were ported and translated, emulators written to allow "old" games to be run on new machines and even circuitry rebuilt from scratch.

This talk will offer some insight into the importance of preserving toys and games. An overview of recent preservation and documentation efforts will be given while showcasing legal challenges, open preservation and documentation communities, the simulation of the (historical) machines the games were played on and the insights gained from playing e.g. then illegal games from the eastern European underground gaming scene..

And finally there will be live examples of abandoned games that can be played by participants after the talk.

Keywords: Discarded Toys - Excavating, Documenting and Reviving Abandoned Digital Games

I. HUVILA

Archaeology of the ballpoint pen, or the authenticity of digital archaeological data

Authenticity of contemporary archaeological archiving is a complex issue that pertains to the entire archaeological information process and spans from the past human activity to the deposition processes, field archaeology, documentation, archiving and interpretation of archaeological data. In contrast to the rather prevalent polarism of technological (e.g., digital preservation standards, technical authenticity of digital repositories) and social approaches (e.g., institutional and individual trust, authenticity certifications, trustworthiness of interpretations) to authenticity research in archival and digital preservation studies, the present study discusses a combined approach.

On the basis of an interview study in which a group of 25 archaeologists were asked to discuss the authenticity and significant properties of archaeological objects and information with a specific reference to a ballpoint pen as a hypothetical archaeological object, a wiki-based framework for capturing, expressing and debating social and scholarly authenticity of digital archaeological data together with technical authenticity information was developed. The framework was evaluated using a test collection of excavation data.

The use of hypothetical archaeological object in the process helped the informants to anchor their discussion of archaeological authenticity on its general properties instead of conferring the often highly context specific situational factors of individual materials and projects. The analysis of the interview transcripts showed clearly that a digital representation of a non-digital object could be provide authentic information, but not function as an authentic object per se, and need to be discussed in parallel to rather than as a projection of each other as a part of a (records) continuum (in terms of Upward and McKemmish) of archaeological records. The developed approach helps to highlight the processual, parallel and dual, socio-technical nature of authenticity of digital archaeological information and materials.

Keywords: authenticity, archaeological information, socio-technical approach, systems thinking

Session: Data standards, documentation and responses to cultural heritage management: examples and new perspectives

(Chairs: A. BIANCHI, Qatar | L. DINGWALL | T. TONNER, UK)

The protection of heritage in the face of rapid urban development presents serious challenges for government bodies and institutions, both at national and regional levels. However, such challenges also present the possibility for fresh opportunities and a re-evaluation of Eurocentric approaches to the documentation and management of heritage. Where prior documentation and inventories are absent, examples of good cultural resource management and documentation in other regions can be used to form the basis of innovative new methodologies and infrastructures tailored to local data standards. The absence of pre-existing documentation or infrastructure also presents fresh opportunities for the application of complementary technologies and data standards at a regional or international level. This is of particular relevance given the connectivity available via the world wide web, offering access to unparalleled digital resources unavailable to an infrastructure developed in isolation. Within such a framework is also the potential for an holistic land to sea approach that provides consistency across terrestrial, marine and intertidal datasets.

This session examines existing regional approaches to heritage documentation and data standards, and considers the future regional potential for web-based heritage management resources and documentation within the GCC and wider region.

Session proposal by Alice Bianchi, Richard Cuttler, Tobias Tonner, Lucie Dingwall

A. BIANCHI | T. TONNER | L. DINGWALL

Qatar: Data standards, documentation and responses to cultural heritage management in Qatar

Qatar, like several other countries in the Gulf region, is experiencing very rapid and extensive urban development that constitutes a serious challenge for the institutions and entities in charge of cultural heritage management at a national and regional level. This paper illustrates procedures, tools and solutions that are being developed in Qatar to effectively undertake the tasks of documentation and protection of cultural heritage in a rapidly changing environment.

Through the integrated application of diverse and complementary technologies like textual information stored in dynamic database modules and remote sensing and geophysical data in GIS-systems, we are designing an effective and sustainable tool for heritage, conservation and cultural tourism

managers, allowing them to make informed decisions, evaluate resource allocations and to perform strategic planning, all in the context of the protection and promotion of terrestrial and submerged heritage assets.

To deliver the technical solution, we are making use of the latest Open Source web technologies and have designed a custom application tailored to the exact needs of the cultural heritage managers in Qatar. At the core of the system is a spatial database which can be accessed via a range of standards compliant web services (REST, WMS, WFS), allowing a variety of applications and corporate systems to interact with the data. To date we have developed two clients, a highly intuitive, bilingual desktop web application which is used to manage the heritage dataset and a mobile web app for surveying heritage in the field. We are now working on additional interfaces for conservation, object registration, excavation, general administration and the promotion of cultural tourism and together these will form a unified and integrated system covering all aspects of cultural heritage management in Qatar.

C. BATTINI | I. CARMOSINO | V. D'ACQUINO

Urban Archeology and representation of data: the case study of convent of S. Orsola, Florence

The technological solutions, made available today, offer opportunities of great interest for the detection in the field of cultural heritage; instrumentation for the survey and advanced multimedia representations for objects of archaeological, artistic, architectural.

These processes have led, especially in recent years, researchers of different scientific disciplines studied the matter, dissolving the problems and identifying possible solutions created by the growing need to create new relationships and new systems for the exchange of information, in addition to a technology that can overlay multiple data together.

The project involves the construction of a web platform for the display and of archaeological data emerged in pluri-stratificated contexts within historical cities.

The case study presented is the Benedictine nunnery of S. Orsola, founded in 1309 and modified and enlarged over the centuries. The investigation of the church, carried out between 2011 and 2012, led to the identification of several building phases, whose chronology is assured by the finding of many artifacts, like pottery and coins.

The project involved the creation of a container structured as a web site, in which we can place records collected and processed including sketches, photographs and 3d-dimensional. Furthermore, the study involves the creation of an app to use and navigate 3D models with smartphone and tablets.

Keywords: App, Laser Scanner, Florence, Web, Convent

W. PREININER | S. RUSSEGGGER

imdás pro - A comprehensive solution for Archaeology

Nowadays collection management systems based on information technologies are widely used and have proven to provide valuable support for the management of objects in the archaeological domain. Archiving of archaeological data is still an important issue not only cultural heritage per se but also for the domain of cultural heritage preservation.

An important fact is also that the presentation of the data becomes more and more important after archiving and putting a lot of effort into the scientific preparation of the data. After several years of data

entry into various databases, it is now possible for cultural institutions to make real use of these data repositories.

As cultural institutions begin to transform their data management applications into smaller and more manageable application modules, it seems likely that data management will become more and more relevant. This is already considered in the imdas pro software package developed at JOANNEUM RESEARCH. The programme can be customised to individual user needs and can be adapted to different types of objects and collections. It supports a combination of visual representations (text, images, symbols, multimedia data, and maps) and intelligent collection management. This concept of customisation enables a flexible software solution for archaeological sites and offers multiple ways of accessing, analysing and presenting the data.

The customization of an information system in the domain of cultural heritage leads to individualisation also regarding metadata and metadata format. In order to enable different organizations with customized imdas pro applications to exchange data with these kind of portals it is necessary to do the mapping definition and further on the export of the data in house – without additional implementation of individual software pieces.

The aim must be to have a flexible configuration tool that allows specifying the mapping between individualized database formats and common public portals like Europeana.

Keywords: archaeology, DAM, conversion, portal

S. RUSSEGGER | T. ORGEL

Enhancing Europe's eXchange in Cultural Educational and Scientific Resources

In the last decade, Europe conducted tremendous effort for making cultural, educational and scientific resources publicly available. Based on national aggregators initiatives like Europeana nowadays provide a plethora of cultural resources for people worldwide. Concurrently, the semantic web, particularly Linked Open Data, has been growing exponentially providing semantic-enhanced access to and interchange of interesting scientific and cultural resources.

Although such massive amounts of culturally rich, educating content are available, the potential of its use for educational and scientific purposes remains largely untapped. The primary reason can be seen in today's Web's content distributions mechanisms: content dissemination is dominated by a small number of large central hubs like major search engines (e.g. Google), social networks (e.g. Facebook) or online encyclopaedias (e.g. Wikipedia). However, much valuable content is only available in the long-tail (i.e. a theory arguing that in internet-based markets niche products are more profitable than mass products). In the long-tail content is maintained and curated by a large number of small to medium-sized professional organisations such as memory organisations (e.g. archives and museums), digital libraries and open educational repositories. However, the few large web hubs hardly support disseminating this long tail content. Changing this circumstance is the goal of the EEXCESS project.

EEXCESS will

- • improve the dissemination, exchange and use of cultural and scientific resources for educational purpose,
- • increase the interconnectedness between scientific, cultural and educational resources to trigger new discoveries and better usage possibilities,
- • increase the use of cultural and historical resources in research and scientific publication processes,
- • increase general public education through facilitating information and content usage possibilities for interested users and raising their awareness on the cultural, scientific and educational wealth existing in today's content repositories, and
- • raise general public cultural and scientific awareness for an improved understanding and integration among European and non-European cultures.

Keywords: cultural content, educational purposes

Session: Visualizing Archaeological Spaces - 3D computer renderings of architectural spaces based on archaeological evidence, historic documentation, and metadata

(Chairs: G. MUSCHIO, USA | P. FERSCHIN, Austria)

There are a growing number of 3D models, animations and augmented reality treatments that purport to represent ancient and historical structures and places. Examination of these models and applications too often reveals that the visualizations are largely based on conjecture and speculation. Virtual Cultural Heritage is an interdisciplinary pursuit involving archaeologists, historians, anthropologists, digital designers and others working with emerging new computer visualization technologies. How can those collaborating in this rapidly expanding field best use archaeological evidence, historical documentation and metadata in the computer renderings of historical structures and places to communicate cultural knowledge and understanding to general audiences? This panel invites those who have grappled with these problems and used methodologies to address the issues to discuss their findings and share their insights.

A. DE MASI

Reality based 3D Modeling and advanced 3D recording techniques detailed to Cultural Heritage

The introduction of digital 3D modeling in the field of Cultural heritage enables the use of models as an interface to share and visualize information collected in databases with web-based tools. The 3D City Models generated by means of photogrammetry and laser scanning are used primarily in urban planning and architecture. CyberCity generates 3D city models semi-automatically from stereo aerial images or laser scanner data with specialized software CyberCity-Modeler that provides easy use of texturing of facades with both terrestrial and aerial images (CC-autotex). With the introduction of CC-VisualStar was developed a photogrammetric workstation with special features for the continuation of the 3D measurement data.

Therefore, the laser scanner at phase difference or at triangulation along with the software Gexcel JRC 3D Reconstructor, and the photo-scanning systems (ZScan and the Z-Map Laser Mencilsoftware)

or photo-matching have provided a detailed picture of the cityscape; associated then the scanner with photo-scanning techniques, extremely precised orthophotos are implemented in a timely manner considered unimaginable with classical photogrammetric processes.

From the methodological point of view, the research was articulated according to Multi-Representation and evaluation of the landscape consisting of a set of cultural, geometric, morphological and dimensional knowledge for the formation of a digital 3D model all implementable with multidisciplinary themes.

These systems serve also to define the processes of maintaining the historic urban landscape.

In addition, the 3D laser scanner returns three-dimensional models "inspected" with a continuous, acquisition, which highlights a cloud of points evenly distributed over the geometric model.

It is obvious that the process is reversed in the traditional survey with laser technology, as only at a later time and according to the objectives to be achieved, the selection criteria and representation of the data collected in clouds of points that reproduce faithfully small-scale reality are operated.

Keywords: 3D City Models, 3D Survey, Gexcel JRC 3D Reconstructor, photo-scanning systems, Multi-representation

M. D. DE PADOVA

Fieldwork 3D interpretation - Integrating established methods and emerging technologies in a Medieval context

Fieldwork interpretation of archaeological data can be at the present time a challenging operation involving several established methods. Combining traditional techniques with advanced technological tools in the archaeological field, creates opportunities to model historical space and time providing the possibility to interpret an archaeological excavation in "real-time". In the present project laser scanner data and computer vision techniques combined with traditional 2D data, allowed the visualization and the interpretation of ancient contexts making possible evaluations of building features in workshops and stores. Computer vision and laser scanner data processed with Agisoft Photoscan and Meshlab were used to evaluate and analyze, in a non-invasive way, medieval buildings. Applying filters to meshes so as to inspect small features, the real artifact shape, measurements, cross sections, it is possible to compare the resulting images with traditional drawings, getting additional information and "real-time" interpretation. From a research point of view, the possibility of an early visualization of different hypotheses allows a deeper comprehension of the archaeological context. This project is aimed at analyzing the remains and reinterpreting the function of medieval buildings in an Italian excavation both during the excavation and afterwards. The challenge is using and recycling old 2D data and drawings, matching them with new acquisitions, trying see in a new light areas investigated many years before.

Keywords: Computer Vision, 3D, Medieval Archaeology, Meshlab, Interpretation

S. HAGENEUER

The visualisation of Uruk – First impressions of the first metropolis in the world

Since 2008 a collaboration between the Oriental Department of the German Archaeological Institute under the supervision of Dr. Margarete van Ess and the Berlin-based conceptual design agency

Artefacts, led by the archaeologists Sandra Grabowski and Sebastian Hageneuer, has been carried out to visualise major parts of one of the oldest cities in the world. A mixture of archaeological data, philological sources, ethnographic parallels and structural considerations were used to reconstruct an ancient city, that is in some places preserved only to a height of a couple of centimetres. The scarce archaeological evidence forced a multidisciplinary approach in reconstructing the site. The results can currently be seen at the exhibition “Uruk – 5000 years of the megacity” at the Pergamonmuseum Berlin.

With the help of examples, I will present the archaeological evidence, the aforementioned problems as well as the ways of problem-solving we undertook to create the final models. The requirements to these models were two-fold: First, they should represent the most-recent state of scientific knowledge based on the actual state of research carried out by the Oriental Department. These simple models should be re-usable for further studies by archaeologists. Secondly, modified models should be presentable to a broader audience and therefore graphically appealing. An exhibition of the city of Uruk was - due to the scarce architectural remains - not possible until now. The newly created computer reconstructions helped to visualise the remains as well the dimensions of the city and are now an essential part in the exhibition.

Keywords: Uruk, 3D, exhibition, visualisation, city

K. MANIA | L. RAGIA

3D Reconstruction of Neoria, Crete, Greece, using Geodetic Measurement and Computer Graphic Techniques

This paper presents a flexible geodetic measurement procedure targeting the photorealistic and interactive documentation and reconstruction of an archeological monument in Crete, Greece. We present an approach based on the speed, range and correctness combined of a total station's measurements of geo-referenced points producing a fully interactive and photo realistically lit geometric mesh of a Venetian building named 'Neoria' by the old harbour in Chania, Crete, Greece. Our task is to fully explore the potential of computer graphic techniques taking as input geodetic measurements and modeling the archaeological monument in 3D enriching it with additional thematic information. The building named 'Neoria' was completed in 1599, involving seven continuous domes and used for ship repair during the winter time. Employing a modern total station results in high accuracy point measurements and quick and efficient spatial data acquisition. The proposed framework creates a detailed 3D geometric model of the monument from the terrestrial points. It subsequently lights the geometric mesh utilizing modern global illumination algorithms and provides advanced interactive functionalities to the user who can interactively manipulate as well as navigate the geometric model. The expert user receives information in relation to the maintenance of the facades of the archaeological monument. For example, based on adequate point acquisition, the user can determine the position and extent of erosions in the material surfaces, whether the surface is smooth or includes bumps, whether there are cleaved and damaged pieces or cracks and of which size, which subsequently require full restoration. It can also be investigated whether the edges of the walls and roof are vertically aligned or whether there are related discrepancies. The goal of the

proposed framework is to offer to the expert user an interactive tool which will help to determine whether the building needs maintenance and the severity of it.

Keywords: semantic modeling, reconstruction, 3D Visualization

M. PFARR-HARFST | M. GRELLERT

Project Report: 20 Years of Reconstructions at Technische Universität Darmstadt

The visualisation and digital reconstruction of cultural heritage has a long tradition at the Department of Information and Communication Technology in Architecture at the Technical University Darmstadt. Beginning with the reconstruction of Cluny III, regarded as a milestone in this area, many important cultural heritage sites have been reconstructed virtually within the framework of interdisciplinary and international projects. By means of a cross-section the diversity and inherent challenges of this project will be demonstrated. Motive, goal, methodology, questions, problem statement and how to deal concretely with these aspects will be the initial focus of the talk. Difficulties that arise in content, administration and technology are shown in selected examples together with possible solutions. There will also be a discussion of the uncertainty pertaining to research results and their transfer into three-dimensionality.

The second focus of the talk will go a step further and will raise the question as to whether, in the meantime, digital reconstructions should be considered a typology or discipline of their own and thus they themselves should become an object of research. With the background of numerous research projects and years of experience I will present the themes and results of current research of the IKA department. The emphasis is on the development of a unified methodology, comprehensive documentation at the level of content and technology, the networking of the community and the confirmation of scholarly quality. The report discusses the present status quo and gives a perspective on future research projects.

In addition to digital reconstruction projects and continuing research themes, the transfer of knowledge by means of digital reconstruction is a core topic at the IKA department. The potentials of three-dimensional data sets for conveying knowledge, the possibilities for their implementation and a critical examination of the topic area will also be presented within the framework of this report.

The talk as a whole can be considered a contribution to the current discussion and reveals open research areas.

Keywords: Project Report: 20 Years of Reconstructions in Darmstadt

E. SIOTTO | L. BENASSI | A. PARRI | P. PINGI | M. CALLIERI | D. LA MONICA | R. SCOPIGNO

From the Archive documentation to standardized web database and 3D models: the case study of the Camaldolese Abbey in Volterra (Italy)

Easy of communication and fast and free interchange of data characterize our age. The use of standards and of a common approach to recollect, organize and present the documentation gives a great advantage for the knowledge and dissemination of the archaeological, historical – artistic and conservation information of Cultural Heritage. Establishing a “correct” documentation policy is the main topic that guided our researches for the documentation, preservation and valorization of the monumental complex of the Camaldolese Abbey, built above Etruscan tombs in Volterra, a medieval

city in Tuscany. In this project we first retrieved the paper documentation in the Historical Archives of the Tuscany Region, to study the historical and conservation data of the monumental complex. Digital technologies have been used to support storing and access to this important information and the documentation and monitoring of the current state of its preservation. The documentation has been digitized and will be accessible through a web database based on the Italian National standards of the ICCD (Istituto Centrale per il Catalogo e la Documentazione). The current state of conservation of some part of the buildings is documented by the creation of panorama images (360 degrees images) and by the acquisitions of geometrics 3D models for selected portions of the monument. In particular, panoramas are used to document the state of preservation of frescoed rooms, while geometric 3D models are produced for the degraded areas of the church that need a constant monitoring. Both panoramas and 3D models, presented in the website of the ArTeSalva project (<http://artosalva.isti.cnr.it/en/virtual-visits>), follow the international standards. The goals of this work are to provide a good-practice example on how to document and disseminate on the web the knowledge available on an endangered monument, following national and international standards, in order to make the knowledge widely accessible. In this way it is possible to modify and improve the old results with new analyses and interpretations of the documents that can be easily shared with other researches from different fields.

Keywords: Archive documentation, Web database, Panorama images, 3D scanning

Session: 2D to 3D: Innovations in cost-efficient and meaningful documentation for cultural heritage recording and excavation

(Chairs: D. BIBBY, B. DUCKE, Germany)

Among the many innovations that the Computer Age has brought to archaeological field practice, 3D recording and documentation is one of the most significant. Hardware-based solutions, such as terrestrial laser scanners and structured light scanners, have been used for this purpose to great effect.

Light-weight and software-based approaches, such as simple 3D surveying, image-based 3D reconstruction, and 3D interpolation of layers from core samples have provided many alternative and complementary tools. The availability of such an extensive toolkit immediately begs the question why full 3D recording and modelling are still not common place in archaeological field work. Apparently, the impact of new technologies is limited by a range of factors such as cost, speed of operation, compatibility with established workflows and the manageability of data. The questions of "best 3D practice" – and in fact best practice for digital survey data in General – still need to be answered. Suitable answer must also include solutions for the archivability and barrier free dissemination of the results.

This session invites contributions that explore innovative and low-cost solutions to the documentation, visualization and analysis of sites and objects of interest. Of particular interest are innovative solutions that integrate well into existing workflows, providing added documentary value with minimal operational overheads whilst producing sustainable digital records and knowledge.

D. BIBBY | B. DUCKE

Survey2GIS: A flexible solution for the transfer of survey data to GIS

Survey2gis is a software capable of producing GIS vector data from structured survey files recorded with total stations, GPS-Systems or other surveying devices. Input consists of one or more simple text file with a point measurement on each line. Output consists of one or more 2D or 3D ESRI(tm) Shapefiles containing points, lines and polygons each in a separate file.

The software is user friendly, features verbose logging and has been optimised to support efficient, simple field recording workflows. It produces fully attributed, topologically clean GIS data in standard formats, suitable for subsequent data analysis. The processing can be adapted to numerous workflows and input data structures via a freely configurable parser. Information input during survey, which is practically only limited by the capacity of the surveying device, is registered in the attribute tables of the Shapes.

Complex geometries are assembled automatically with options for user-interaction such as snapping the boundaries of adjoining polygons and/or stamping out overlapping polygons or “polygons within polygons”.

Survey2gis exists as a stand alone utility for integration into pre existing workflows and as a plugin to gvSIG-CE with preconfigured, editable libraries for automatic allocation of sym-bology to objects such as archaeological contexts and finds during procesing.

Extensive field use on archaeological excavations in 2013 have proven the robusticity of the system. The software open source and runs under Windows, Mac OS X and Linux operating systems.

Keywords: GIS, Survey, Software, Total Station, GPS

S. CHAPMAN | M. LORENZON

3D modeling and mudbrick conservation at Tell Timai, Egypt

The compilation of a detailed 3D representation of archaeological data is of great importance, either for documentation needs or for restoration purposes.

The aim of this paper is to offer a preliminary result of a project that combines 3D modeling with conservation of the archaeological data. The present example is the monumental 3rd- 4th century A.D. large public structure at Tell Timai in the northeastern Egyptian Delta.

The outstanding mudbrick building has a preserved height of 8 metres and the structure still preserves part of a window, a spiral staircase to allow access to the second and third floors, and monumental walls that have a thickness of 7 metres.

A 3D model of the entire building could be really important in order to understand its function, to do a condition assessment, and to figure out conservation options.

The necessary 3D data is derived from photogrammetric techniques using the software package Agisoft Photoscan Standard. Our methods for creating 3D models include the use of orthorectified aerial photos taken by remote control quadcopter and terrestrial photos taken using a full frame DSLR. The software is cost effective and our hardware requirements are minimal, including the use of digital cameras.

The development of the most widespread 3D modeling techniques has made it possible to export the data in a variety of forms including Adobe PDF. It is preferable to disseminate this data in the form of a PDF, which is a published and nearly universally accessible format.

The ongoing development and updating of such information techniques allows a broader use of them in activities related to any branch of archaeological fieldwork and consequent archival documentation.

Keywords: 3D modeling, documentation, visualisation, Conservation, mudbrick architecture

J. DE REU

Image-based 3D modelling, a (r)evolution in archaeological excavation practice?

Image-based 3D modelling has already proven its value for the recording of excavations, however until now its application remained rather small-scale. We have examined image-based 3D modelling in the recording of entire archaeological excavations in Belgium and Iraq, and its impact on the workflow of the excavation process and the post-excavation processing.

Our results suggest that image-based 3D modelling can be an excellent method for registration, documentation and visualization of excavated heritage. Proceeding from a 2D to a 3D recording is of paramount importance for increasing the scientific value of the excavated and digitally preserved heritage. The high-resolution geometric information allows a straightforward quantification of the data. The datasets can act as a robust basis for further integration with other survey and excavation datasets. Image-based 3D modelling also brings along new challenges, e.g. data management and storage and the changed workflow of the (post-)excavation process.

Without doubt we believe that the possibilities of image-based 3D modelling for the recording of archaeological excavations are far exceeding its current limitations. The quality of the data recorded and usable with image-based 3D modelling is already far beyond the possibilities of traditional recording techniques. Therefore, we believe that image-based 3D modelling can cause a(n) (r)evolution in archaeological excavation practice.

Keywords: Three-dimensional documentation, Archaeological heritage, Excavation methodology, Orthophoto mapping, Structure from motion

B. DUCKE | D. BIBBY

Pathways to seamless and low-cost 3D data acquisition and management

Among the many innovations that the Computer Age has brought to archaeological field practice, 3D digital data acquisition must be considered one of the most spectacular. However, the fact that full 3D site recording and reconstruction are still not part of the "archaeological routine" indicates that the impact of new technologies is limited by a range of factors that include much more than just technological problems. These include the cost and efficiency of 3D-capable hardware and software, as well as their intrusiveness to established workflows, regarding both data acquisition and management. Significant faultlines remain between 2D traditions and 3D technologies. The issue of "best 3D practice" remains to be resolved, and practical guidelines must also consider the challenges of long-term archivability, standardization and barrier free dissemination of 3D data.

This paper focuses on innovative, lean and low-cost approaches to the 3D documentation of archaeological sites and other objects of interest. It discusses solutions that integrate seamlessly with

existing workflows and thus provide added data value at small operational overhead, such as rapid tachymetric recording and images-based reconstruction. It also presents some selected, freely available software tools that have been designed with archaeological end users in mind. The integration of these tools into actual field work is illustrated using case studies. The papers technological coverage also includes aspects such as the interplay of 3D data with other software, in particular the challenges of GIS vs. CAD and topological data models.

Keywords: 3D documentation, rapid 3D modeling, low-cost workflows

F. GALEAZZI | S. LINDGREN

Comparison of Laser Scanning and Dense Stereo Matching Techniques in Diverse Environmental Conditions and Light Exposure: the Case Study of Las Cuevas, Belize

The use of three dimensional technologies for the documentation of archaeological and cultural heritage sites is well established today, but this can be challenging because researchers have yet to integrate these technologies to develop a complete and coherent methodology for the 3D documentation of sites. Laser scanning and, recently, dense stereo matching techniques have shown to be very powerful tools for the 3D documentation of the archaeological excavation and context. The proposed work tests and compares laser scanning and dense stereo matching techniques at Las Cuevas site (Belize), to find the most appropriate methods to document different aspects of an archeological site, based on diverse environmental conditions, light exposures, and varied surfaces. The complexity of the Las Cuevas' site allowed testing the 3D documentation techniques in areas of the site presenting different environmental conditions and light exposure: dark recesses of caves; areas in shaded sunlight under the jungle canopy; and places of more direct sunlight in areas that have been cleared of brush or exposed by tree fall.

This paper presents the results of the metrical comparison between the 3D models obtained using phase shift variation laser scanner (Faro Focus 3D) and dense stereo matching software (Agisoft Photoscan). The comparison of the co-registered surfaces was performed in both open source and commercial point cloud and mesh processing software based on the shortest point-to-mesh distance considering the normal to the mesh faces.

This study points to dense stereo matching as the most economical, portable, flexible, and widely used approach for the 3D documentation of archaeological sites today. Nonetheless, the result of the quantitative comparison underscores the need to integrate this technique with laser scanner technologies, when the data acquisition of micro-stratigraphy is required. This kind of research can help defining best 3D practices for the documentation, visualization and analysis of sites.

Keywords: 3D documentation, archaeological excavation, laser scanner, dense stereo matching, accuracy.

M. NABIL

Time-lapse Panoramas for the Egyptian Heritage

While laser scanning and Photogrammetry has become commonly-used methods for recording heritage and archaeological sites in 3D, it still misses photorealism. On the other hand, panoramic photography can provide photorealistic record of a site but with no third dimension.

Panoramic images can be enriched by adding the time dimension to it. In most heritage and archaeological sites, the time dimension is very important because it dramatically affects how the architecture and sculptures in a monumental site look in daylight changes, a factor that site visitors are unable to experience.

In this paper, we are going to present a framework for recording time-lapse panoramas using a consumer panoramic head, digital SLR and open source software. We will present the pipeline in details as follows: 1) shooting of multi-row panoramic images using a motorized head, 2) processing of the images to create HDR's and panoramas, 3) rendering spherical panoramas, and 4) an Immersive Virtual Reality system to display the results. The pipeline will be illustrated through case studies from the Egyptian heritage.

The paper will include also some of the typical challenges that face the process of capturing, processing, and displaying time-lapse panoramas and how we were able to overcome using open-source software. It will focus on problems related to images alignment for the purpose of exposure manipulation and panorama creation and how they can be handled using recent advances in Computer Vision algorithms.

G. OVERMARS

Using a pseudo-3D GIS to interpret old archaeological data

In this paper we will present our approach to elaborate analogue archaeological data using digital archaeological techniques. One excavation trench measuring 40 x 20 meters on the site of the early medieval emporium Dorestad was used as a case study. Dorestad consisted of a harbor and trading area, a rural area and several cemeteries. It was located in the central part of the Netherlands on the banks of the river Rhine. The site was excavated from the late 60s onwards and remains one of the largest archaeological excavations in the Netherlands. So far, large parts of the excavation have never been published. In the present study, a small part of the unpublished documentation was used as a case study to evaluate a method combining the old analogue documentation with digital archaeological techniques. Analogue field sketches were studied in detail and digitalized in a two dimensional GIS environment. First, all individual archaeological features like postholes, ditches, pits and graves were drawn. After digitalizing the individual features a database was created by adding information on character, shape, size and depth to the features. Next, the results were translated into a pseudo-3D environment after which the data could be analyzed. Different queries were formulated to get an overview of all features making it possible to recognize structures like buildings, walls and fences. Last, based on the pseudo-3D GIS, time as a fourth dimension was added by observing different phases in the construction of structures. By using this method it became possible to interpret and visualize parts of the old excavation data of Dorestad.

Keywords: Archaeology GIS 3D Dorestad

J. QUARTERMAINE | A. E. KILLEBREW

A new approach to 3D documentation of excavation and landscape at Tel Akko, Israel

Tel Akko, a major Mediterranean maritime center, is situated southeast of the modern town of Akko, Israel. Large scale excavations on the mound from 1973 to 1989 yielded remains spanning the Early Bronze through Hellenistic periods (ca. 3000 BCE – 100 BCE). Beginning in 2010, the renewed excavations at Tel Akko Total Archaeology Project under the auspices of the University of Haifa and directed by A.E. Killebrew and M. Artzy (University of Haifa), implemented a multi-faceted approach to investigating Akko's past that includes systematic excavation, an intensive pedestrian survey, a robust conservation plan, and the development of a cutting edge multi-dimensional 3D documentation program.

The recording system has been designed to address the needs of recording very complex and deep stratigraphy in the excavations, to integrate this with landscape surveys across the rest of the tell, and to link in with archival data from previous excavations. Key to this has been the storage and manipulation of 3D data within a project GIS system, which is connected to a tabular filemaker database to deal with the recording of the day to day narrative and of finds data. The primary 3D graphic data is created by means of photogrammetry and uses innovative and state of the art software (Agisoft PhotoScan) to generate modelled surfaces at each stage of the excavation and of the overall tell. This process utilizes digital aerial photography that is captured alternately from a photographic mast, a balloon and from a small, remote controlled hexacopter. The resulting 3D interactive record produces a total record of the excavated data, provides a valuable legacy record of Tel Akko's archaeological features, and creates an effective public presentational tool.

Keywords: Akko, 3D documentation, photogrammetry, archaeology

I. TRIZIO | R. CONTINENZA

From the Structure from Motion to 3D Information Systems: integrated procedures for survey and archaeological documentation.

Methodology:

One of the main innovations that in the last decade affected the archeology has been the intensive use of computer technology. In particular, the Geographic Information Systems have become essential tools for the analysis, the management and consulting of the archaeological documentation, due to their flexibility and ability to operate in relation to the protection of the Cultural Heritage.

Recently, moreover, are spreading the software that provide the possibility to make accurate three-dimensional surveys, quickly and comparable to laser scanning techniques, by the software of Structure from Motion (SfM) that very often are based on cloud computing.

The objective described in this paper was to develop a procedure based on the integration of SfM and GIS software, indicated as a perfect tool to document, describe and display large amounts of information.

Results:

The procedure involves the integration between SfM software and GIS 3D, through import into the GIS of the textured mesh derived from the cloud, has been tested on the Roman site of Civita di Bagno, which includes a monumental archaeological complex strongly characterized by the presence of

semicircular substructures built on different levels and long straight walls, which support a terrace with buildings affected by different building phases.

The result of the work can be seen in a 3D GIS which displays a 3D model of the building, texturized and queried, to which were attached the informative content linked to the site.

Innovations:

The whirling evolution of computer technologies requires to the operators a continuous upgrading. In this case, the testing of the SfM technology, and the import of its products in a GIS environment, make cheaper and also expeditious operations of survey, setting free the operators from the use of procedures already in use and considerably reducing the budget of the interventions on the archaeological heritage

Keywords: archaeological surveying, GIS3D, 3D modelling

M. WAAS | D. ZELL

Practical 3D Photogrammetry for the Conservation and Documentation of Cultural Heritage

The past few years has seen many developments in the world of 3D modeling of architectural and archaeological heritage. One of these developments is the expansion of 3D photogrammetry modeling programs into the practical and affordable world. Utilizing open-source software such as Meshlab, freeware such as 123D Catch, and licensed software such as Agisoft PhotoScan Pro, it is now cost-effective to utilize photogrammetry on any project. These programs offer the world of practical heritage conservation an innovative and powerful tool for documentation, visualization/virtualization, and planning. This paper reports on the results of developing a low-cost methodology to pursue photogrammetry in the conservation of cultural heritage and in archaeology in the State of Israel for the Israel Antiquities Authority. Compared to high-cost alternatives such as laser scanning, which has been utilized in Israel before, the results have shown how effective photogrammetry is and can be for conservation and documentation of cultural heritage. Some of the applications include high resolution rectified models of effectively 2D planes (mosaics, wall and ceiling paintings), conservation planning on small and large scale cultural heritage sites, and the documentation of archaeological sites in 2D and 3D. By approaching photogrammetry from a low-cost level, it not only encourages its application in the field, it allows professionals at all levels to engage with the technology and to learn how to utilize the technology, whereas previously the application of the technology has been restricted to institutions and companies with enough capital and resources to spend learning and utilizing the technology and to hobbyists and other interested professionals, many of whom helped push the field towards lower costs.

Keywords: photogrammetry, conservation, heritage, documentation

Session: Infrastructures and services for sharing of archaeological documentation

(Chairs: E. ASPÖCK | G. GESER, Austria)

Archaeological documentation work is becoming increasingly collaborative, distributed and data-intensive. In this context, data workflows, standard metadata, open access repositories and novel methods of semantic data integration (e.g. Linked Data) have a key role to play in ensuring effective

management of documentation. The session invites researchers, documentation and data repository managers to present and discuss current standards and viable further improvement in the sharing of research results among and between collaborating research groups.

The background to the session is the emergence of national and European infrastructures and services for research data of many disciplines beyond the initial focus on some natural sciences. Archaeological research involves knowledge and methods from domains of the natural sciences and humanities, building on data from excavations, field surveys, laboratory and other analysis of the different types of archaeological evidence. Therefore, the development of repositories, infrastructure and services for archaeology poses particular challenges.

Contributions to the session are expected from documentation standardization, repository and infrastructure projects, including the recently started European project “Advanced Research Infrastructure for Archaeological Dataset Networking in Europe” (ARIADNE).

Suggested presentations and papers may address any related topics including, but not limited to, the state of the art and novel approaches in documentation metadata, repository management, data aggregation, sharing and open access, and interoperability of digital infrastructure resources and services.

Brief information about the ARIADNE project:

Advanced Research Infrastructure for Archaeological Dataset Networking in Europe (ARIADNE), EU FP7-Infrastructures, 02/2013-01/2017, 24 partners from 16 countries.

ARIADNE is a project funded by the European Commission under the Community's Seventh Framework Programme, contract no. FP7-INFRASTRUCTURES-2012-1-313193.

E. ASPÖCK | G. GESER

What is an archaeological research infrastructure and why do we need it? Aims and challenges of ARIADNE

This paper provides background information to the session and addresses the following questions:

What is an archaeological research infrastructure? Why do we set up ARIADNE (Advanced Research Infrastructure for Archaeological Dataset Networking in Europe), and what will the archaeological research community gain from it? What are the challenges of the project and how are we going about to solve them?

Research infrastructures are facilities, resources and related services used by the scientific community to conduct research. In archaeology, digital research infrastructures exist in several European countries providing access to data from diverse areas including for example archaeological sites, images and scientific measurements.

Within the EU FP7 project ARIADNE (www.ariadne-infrastructure.eu) a virtual data infrastructure will be set up integrating archaeological datasets distributed across European institutions. Existing datasets will be made accessible for use (re-)use trans-nationally via new web-based services through a common interface.

The aim of ARIADNE is to develop useful research services and to facilitate collaboration among archaeological research groups in Europe and beyond. Best practice in ICT-enhanced methodologies

in archaeology will be identified and shared. ARIADNE will also be connected to related European initiatives, e.g. the Digital Research Infrastructure for the Arts and Humanities (DARIAH).

Making datasets accessible, e.g. search across institutions and research domains, poses technical and conceptual challenge. Data are held in many different forms and in a number of languages.

Therefore technical problems have to be solved to allow communication at machine level, and semantic interoperability has to be achieved based on unambiguous definition of archaeological concepts.

Moreover, commitment to a culture of data sharing is necessary, including to make data available, but also to be able to rely on data provided by others.

Keywords: research infrastructure, datasets, culture of data sharing

M. CHARNO | J. RICHARDS

Crossing Borders: International Interoperability at the ADS

The Archaeology Data Service (ADS) founded in 1996, is a national repository for digital data from the UK historic environment sector. The ADS has a mandate to provide a digital repository for outputs from research funded by national funding bodies within the UK, which has led to a considerable archive of data and metadata. Within archaeology there has been an increasing use of the web for data dissemination for some time, but datasets continue to be fragmented and isolated. To address the issue of “data siloing” (i.e. data only discoverable and/or accessible from a single location), the ADS partnered with other UK heritage bodies to develop a portal to make sites and monuments records cross-searchable across the United Kingdom. With European Commission Culture 2000 programme funding we were able to extend the approach to work with a number of European partners in ARENA (Archaeological Records of Europe Networked Access), which sought to develop a framework capable of

protecting and promoting digital cultural archives of European significance relating to archaeology.

The ARENA portal provided a distributed search of sites and monuments data from six different European countries: the UK, Denmark, Norway, Iceland, Romania and Poland. Within the preparation phase for the European DARIAH research infrastructure we were subsequently able to provide a technical demonstrator which added new partners and upgraded the ARENA infrastructure and technical framework. ARENA2 highlighted the quickly changing nature of Service Oriented Architecture (SOA) approaches, which led to the implementation of newer technologies underpinned by the same philosophy. Finally we have extended the approach to partners in the United States. The Transatlantic Archaeology Gateway (TAG) was funded by the Joint Information Systems Committee (UK) and the National Endowment for the Humanities (USA). It developed web services and a search interface for cross-searching the archives held by ADS and Digital Antiquity. TAG was the first exam

Keywords: Interoperability, Web Services, Portals

P. CONSTANTOPOULOS | C. DALLAS

DYAS: The Greek Research Infrastructure Network for the Humanities

The mission of DYAS, the Greek Research Infrastructure Network for the Humanities, is to support the Greek communities of humanities researchers in advancing their work using ICT and in exchanging

knowledge and working practices; to broaden the scope of and opportunities for research through the interconnection of various distributed digital resources; and to promote the access, use, creation and long-term preservation of research data, both primary and secondary, in digital form. DYAS is also charged to operate as the Greek component of the European Infrastructure for Arts and Humanities, DARIAH. DYAS is designed as a distributed infrastructure with members at distinct levels of involvement: management nodes, providing the services of the infrastructure and setting the specifications for digital resources(currently, the Academy of Athens and the DCU, R.C. Athena); curators, responsible for specific collections and added-value repositories; affiliates, providing selected metadata for ingestion by the management nodes. In addition to members, external users can subscribe to specific services of the network, thus widely offering the benefits of DYAS and DARIAH services to researchers, educators and collection managers. By promoting standards, interoperability frameworks, common practices, authorities and services, DYAS intends to foster multidisciplinary activities and to establish links with thematic infrastructures, such as ARIADNE. The services being developed by DYAS fall in four groups: (1) sharing digital resources through a set of data, person, metadata, vocabulary and software registries; (2) support for resource development, through a series of guidelines and specialized tools; (3) contributing to DARIAH services, by participating in specific tasks of the Virtual Competency Centres; and (4) a digital humanities observatory to support continuous monitoring and recording of the advances in the field and to undertake dissemination actions.

The service architecture involves layers of common curation and interoperability services and employs cloud computation and data management services. "

Keywords: interoperability, registries, digital curation, research network, infrastructure

A. CORNS | R. SHAW

Integrating archaeological remote sensing data within SDI and INSPIRE frameworks

Over the past 25 years the ability to collect high resolution remote sensing data including geophysics, lidar and aerial imagery for the purposes of archaeological monuments and landscapes has revolutionised our knowledge and management of our shared heritage. However, once processed and interpreted remote sensing data is only usually available to other researchers and interested organisations in the form of an abstracted image or contained within a pdf document, thus removing the underlying data which created the image. The full research potential of this data has therefore never been fully realized as future reanalysis of the data with advanced algorithms and spatial tools is impossible or difficult at best. In addition, much of this data is costly to collect, particularly in the case of lidar, therefore the ability to reuse this remote sensing data is economically advantageous to the archaeological domain.

This paper discusses the exploring, the sharing and reuse of remote sensing data within the context of spatial data infrastructures (SDI). By extending and developing the established EU INSPIRE directive, interoperable services including web coverage services (WCS), web feature services (WFS), web mapping services (WMS), and supporting metadata schemas can encourage their reuse and sharing. In addition, the development of open access to shared algorithms and processing tool kits, specifically developed for the archaeological community, enables new archaeological discoveries to be made

within this available data. This paper highlights some of the efforts and research to share and reuse data carried out within the EU co-funded ARIADNE and ArcLand projects.

Keywords: Remote sensing, SDI, INSPIRE, web services

C. DALLAS | D. GAVRILIS

The ARIADNE interoperability framework, component architecture and registry service

We present the ARIADNE approach towards integration of heterogeneous archaeological resources and tools into a digital research infrastructure capable of addressing the needs of cutting-edge and emerging technology-enabled archaeological research across Europe. Drawing from a comprehensive workplan, which involves conceptual and technical work regarding the planned research infrastructure and culminates in large scale trialling and transnational community engagement, we will address: Firstly, our methodological approach, based on evidence-based analysis of actual and prospective user needs and requirements analysis, reliance on semantic technologies, and standards conformance.

Secondly, preliminary results on the specification of the ARIADNE architecture, focusing on:

- 1) the ARIADNE interoperability framework, including the internal (API-based) and external (human) interfaces to the infrastructure and consisting of: a) Repository management, catering for metadata, metadata schemas, vocabularies, thesauri, gazetteers, and datasets, b) Metadata registry, providing a catalog of metadata schemas, with elements semantically organized according to ISO11179, c) Import service, ingesting metadata schemas and thesauri to the registry, d) Harvester, gathering metadata from archaeological collections, e) Aggregator, and f) Service Orchestrator,
- 2) planned integrated services, including a) Ingestion, b) User interface components, c) User authentication and authorization services, d) Visualization services, and e) Long-term digital preservation services, and,
- 3) the architecture and functional specifications of the ARIADNE metadata registry, driven by an evidence-based survey and analysis of metadata schemas, existing mappings between them and from/to CIDOC CRM, and SKOSified archaeological thesauri and vocabularies, and based on the ISO 11179 and ISO 15000-3 standards, as well as on frameworks defined by the DESIRE, ROADS and Open Metadata Registry-NSDL projects.

Finally, the innovative potential of the ARIADNE infrastructure, as substantiated by an evidence-based approach to functional specifications, a strong emphasis on interoperability, semantic technologies and standards, and support for digital preservation and active data curation by data custodians and archaeologists.

Keywords: interoperability; metadata registries; archaeology

M. DOERR | G. HIEBEL

Developing common European archaeological concepts through extending the CIDOC CRM within ARIADNE

Infrastructures and services for sharing archaeological documentation have to be based on a common understanding of the underlying concepts of documentation. ARIADNE (Advanced Research Infrastructure for Archaeological Dataset Networking in Europe) defined as standard Conceptual

Reference Model the CIDOC-CRM (ISO 21127:2006 – A reference ontology for the interchange of cultural heritage information). The Foundation for Research and Technology - Hellas (FORTH) will lead the extension of the model to improve its fit for specific subdomains that are important for archaeological research. Among others this will be site descriptions (in particular as concerns excavation data), scientific data (e.g. chemical and physical analyses) and complex spatial, temporal and part-whole concepts. Basic concepts are already present in the CIDOC CRM but they are often rather general and do not allow to include the specificity of information in the archaeological documentation that is often required in these subdomains.

The methodology for building the envisaged extensions is to analyze existing data structures and datasets of project partners and use the bottom-up ontology engineering process that was developed during the building of the CIDOC CRM. The participation of leading European national archaeological institutions in ARIADNE is a unique opportunity to develop a shared conceptualization of the European archaeological community.

With selected examples of data structures and data sets from the national archaeological institutions we will present the methodological approach and the first results of common European archaeological concepts refining the CIDOC CRM concepts.

Keywords: Archaeology, Information Integration, Ontology, CIDOC CRM

H. HOLLANDER

The e-Depot for Dutch Archaeology – Archiving and publication of archaeological data

In the Netherlands, the archiving and publication of archaeological research data has led to the establishment of the e-Depot for Dutch Archaeology (EDNA) <http://www.edna.nl/>, accommodated at DANS <http://dans.knaw.nl/en>. EDNA is a collaboration between DANS and the Cultural Heritage Agency (RCE). DANS is an institute of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Netherlands Organisation for Scientific Research (NWO).

The slogan "Digital archaeology requires a digital memory" was used in recent years to bring care for digital data to the attention of Dutch archaeologists. The e-depot ensures durable archiving and unlocking of all digital documentation of the archaeological research. By 2013, DANS provides online access <https://easy.dans.knaw.nl> to more than 20,000 datasets: 17,000 archaeological reports and 3,000 large datasets consisting of data of excavations and explorations (photos, GIS, data-tables, drawings). Both the research descriptions and all data can be downloaded via the online archiving system EASY.

Agreements to this end have been laid down in the quality standard for Dutch archaeology. DANS ensures that access to digital research data keeps improving, through its services and by taking part in national and international projects and networks. By participating in projects such as Odyssee, CARARE, ARIADNE and DARIAH, the options for finding, accessing and re-using archaeological and other data are continuously improving. DANS stimulates cooperation between data producers and users and does research into long-term accessibility.

The existing infrastructure of the e-depot for Dutch Archaeology allows for sharing of good practices such as long-term preservation, data organisation and data dissemination for accessibility.

Keywords: Archaeological data, archiving, publication, access

U. JAKOBSSON

Swedish National Data (SND) services, the OAIS reference model and archaeological data

The Open Archival Information System (OAIS) model and its workflow provide the basis for SND's activities and how we handle research data. This goes for all kinds of data that are deposited at SND, including archaeological data.

The workflow comprises all activities from the moment when researchers deposit data at SND and the following quality control (Ingest); the enhancement with metadata, production of codebooks (Data Management); policies and recommendations (Preservation Planning); archiving the data for long time storage (Archival Storage); up to the moment when we make the data searchable via web interfaces and accessible for new research (Access).

The OAIS model has been applied, for example, for the data of more than 360 archaeological surveys (388 datasets; shape-files, reports, Access databases, >40,000 files, >7.3 GB), a few thematic databases of archaeological data, and it is used for long-time storage of parts of the Swedish Rock Art Archive material (>12,000 tif-images, >1TB). The survey data is from one (out of 22) counties and from the 21st century only. SND have only received archaeological data during the past two years and expect a tenfold increase within the next few years.

Since SND did not have to take care for archaeological data until 2011, how it was structured, what metadata was needed (for SND as well as for the archaeological community), and how to document them had to be learnt and implemented. Furthermore SND had to inform the depositors about how they in turn could improve their data and metadata.

The GIS data are the first archaeological data that SND has made directly downloadable without any registration and free for anyone who wants to use them. These data are also among the first at SND where versioning has been fully implemented as well as geo-spatial information documented using the Data Documentation Initiative (DDI) standard.

Keywords: archaeology, archive, workflow, data, metadata

A. MASUR | K. MAY

Comparing and mapping archaeological excavation data from different recording systems for integration using ontologies

Sharing archaeological data across national borders and between previously unconnected systems is a topic of increasing importance. Infrastructures such as ARIADNE (Advanced Research Infrastructure for Archaeological Dataset Networking in Europe) aim to provide services that support sharing of archaeological research data. Ontologies such as the CIDOC CRM and its archaeological extension CRM-EH are appropriate instruments to harmonize different data structures and thereby support data exchange.

Before integrating data by mapping to ontologies it is crucial to establish where the shared meaning of the data lies and to understand the methodology behind the data record. As the largest proportion of archaeological data are derived from excavations or field investigations the initial focus falls on the documentation of these "raw data". But documentation often varies depending on country-specific guidelines, different excavation methods and technologies, project management requirements,

budget, etc. Therefore an analysis of the different recording forms should prove helpful to identify the common meanings of concepts and terms used in archaeological fieldwork.

This presentation will show first results of research based on the collection of excavation report forms and manuals from different countries which cover a range of fieldwork methodologies (e.g. single context recording, box trenches, palaeolithic excavations, etc.). The aim is to analyse and compare the different methodologies, the archaeological concepts involved and the data records, perhaps for the first time on an international level. We want to discuss the challenges of integrating different concepts, terms and vocabularies, often in different languages, and whether problems with integrating such archaeological data could be addressed by additional archaeological extensions to the CIDOC CRM.

Keywords: archaeological recording systems, extending ontologies, CIDOC CRM, CRM-EH

G. MOSSAKOWSKI

media.REIFF: A database for linked data documenting monuments and sites

The Aachen Center for Documentation and Conservation (ACDC) and the Faculty of Architecture at RWTH Aachen University were in need of a common infrastructure for collection and display of files and metadata for different research and study projects in architecture and archaeology. Projects include the documentation of heritage sites in Afghanistan (monument documentation, site register) and Pakistan (Mohenjo-Daro and sites in the Sindh province) as well as architectural guides for Aachen or Cameroon.

Therefore media.REIFF was developed, a web-based open source database. Each project can develop its own lightweight ontology. The database stores objects, representing files or metadata, belonging to different classes defining a group of objects. Each object gets a permanent textual identifier (for citation) as an alias to the object ID. Objects can be linked to other objects (with a parent, child or equal relation). Objects can be tagged or associated with properties from hierarchical taxonomies, with geographical or local coordinates, dates and times. Names and descriptions of objects can be added in different languages.

The complexity the researcher needs for her media can be reduced for the people who collect the data: students or sometimes even untrained staff members on-site. Original files will be archived unchanged, thumbnail images in different sizes help browsing through the collections. Existing metadata can be imported or even synchronized. This currently includes external research databases, staff identity management and the study guide of the university.

The data can be displayed in different formats, e. g. as lists, as galleries or on maps. Several export formats are available: CSV for tabular data, ZIP archives of images, PDF export for books, KML-Export for Google Earth and others.

Keywords: databases, ontology, low cost, flexibility, ease of use

T. OIKARINEN

Developing Archaeological Excavation Data Management: a Local Case Study

Typically, even a single digital data collection (i.e. a report) recorded in an archaeological excavation consists of various kinds of processed data, which is either digitized or digital-born data. The original paper-based documents and non-processed digital data are rarely available. The collected data

represents the archaeological site using verbal, numerical or visual media and exploiting different techniques such as printed reports, databases and digital images. These diverse (re)presentation modes are a synthesis of the archaeological field work and the related research and interpretation. When the understanding of the whole archaeological excavation process and the details of the collected data are needed, one needs to be able to utilize the digital data collection as a whole. If the amount of data is considerable and dispersed in separate documents or files the utilization of the data is likely to be difficult, even when the content is organised.

A local case study in question is a part of an ongoing dissertation research in which interdisciplinary approaches are applied to develop the production and the use of the archaeological data. The case study has three aims: (1) to collect and synthesise the preconditions, recommendations and experiences related to digital archaeological excavation data from various sources, (2) to study and analyse a free and open source archaeological data management software and (3) to analyse a local and mostly digitized archaeological data collection in the light of the synthesised generic requirements and the data management software analysed, and vice versa (i.e. the requirements the local digital data collection sets to the software). In the presentation some results of the case study will be discussed. In a long run an organised digital data collection is a basic component needed in the development of the archaeological digital infrastructures, so the nature of the archaeological local data collections needs to be studied.

Keywords: archaeological data management, interdisciplinary, case study

F. SCHÄFER | M. TROGNITZ

Developing a research data centre for Germany: IANUS and its IT-guidelines

IANUS is a project which aims to build up a national digital archive for archaeological and related data in Germany. Once established it will be comparable to eDNA in the Netherlands and ADS in the UK. Primary goals will be the long-term preservation, the dissemination and the aggregation of digital data. Furthermore IANUS will offer manuals, advice and best practice examples for handling digital data in the classical and ancient studies. Ongoing collaborative projects shall be supported with sync and share services to enable the exchange, the backup and the management of data across institutional boundaries.

Among the core services will be the IT-guidelines which comprise both accepted standards and best-practice examples and which IANUS is going to promote within the German community in order to help data producers to improve the data handling and to enhance the consciousness for the data quality within research projects.

The talk will provide an overview of the conceptual ideas, the testbeds, future work, and challenges to be faced, and has a focus on the IT-guidelines.

IANUS is very much a joint venture of different German institutions generating and providing primary research data – e.g. universities, research institutes, academies, state offices for cultural heritage, museums, etc. – on the one hand and infrastructural partners such as libraries and data centres on the other. The project is funded by the DFG and is coordinated by the DAI.

Keywords: archiving, documentation, data repository, standards

Which infrastructure support for visual data creation, archiving and visualization?

Visual data are nowadays a basic component of the massive data gathered in archaeology. With the term visual data we mean any visual representation that could be associated to an artwork, architecture or site, to describe its shape in terms of visual and geometric elements. Therefore, different representations are included: 2D images (standard images, panoramic images, Reflection Transformation Images - RTI), 2D graphical representations such as maps or drawings (usually represented by standard digital image files), 3D models (either sampled or reconstructed with modelling systems) or finally videos (grabbed from reality or computer animations).

In the framework of the ARIADNE project, we are focusing on the services that an infrastructure for archaeological documentation should provide for managing these media. Our first goal is to present to users the capabilities of current technology (both commercial tools and resources produced in few recent EU projects) and to understand how to map the real needs of the user community on existing technologies and potential services for production, sharing and visualization.

Training is an important component of an infrastructure project, due to the many media available and the complexity of both mastering data creation/presentation and of understanding which media fits better the specific documentation or visual analysis needs. Our purpose will be to help our community in building a clear view of the affordances of particular genres of representations, clarifying their documentation potential and the possible limitations wrt. storing, discovery, accessing, connecting with other data, and rendering. Designing an infrastructure requires also focusing on configuration and/or development (e.g. customization to user needs of open source solutions and of academic prototypes developed by EU projects).

Obviously, visual data cannot be treated isolated from the other data. Integration should be designed to allow advanced visual data creation and visualization to inter-operate with standard databases and repositories.

Keywords: archaeology, visual media, images, 3D models, access, visualization

A. VOLKMANN

Beyond administrative boundaries: archaeological networks of research

Digital data infrastructures for the arts and humanities are currently being developed within the framework of various projects in Europe. Among these projects, DARIAH (Digital Research Infrastructure for the Arts and Humanities) is one of the largest projects. And it is designed as a long-term project. DARIAH focuses primarily on philology and history. But the project is open to other disciplines. So DARIAH is also conceptualizing a data infrastructure for archaeology. The cooperation with other infrastructure projects is a key component in the architecture of the digital data infrastructure for archaeologists. Within the network of the different data infrastructure projects, DARIAH could be aimed to harmonize the national activities on the EU level. International data networks of archaeology are desirable in related regions such as the Franco-German upper Rhine region to go beyond existing administrative boundaries of research.

But what are the specific needs of archaeologists to a digital research data infrastructure? Is it even possible to implement a centralized research data infrastructure (that is accepted by the researchers)

in the very heterogeneous landscape of archaeological sciences in Europe? Therefore, it seems very important right from the start of the project to involve as many partners as possible in the conception of the infrastructure. E.g. the structure of federal states in Germany did not enable the foundation of a national archaeological data service, such as in the Netherlands or the UK. The political conditions are contrary to centralized efforts. Thus, a decentralized architecture of the data infrastructure represents a solution to the existing problem. A cooperative project with equal partners should bring together both: the research at the universities as well as at the national archives of administration. It makes mutually accessible the respective databases for all partners. Furthermore the DARIAH service could provide a redundant long-term binary data storage with sovereign rights of data privacy and security requirements.

Keywords: Digital research infrastructure for archaeology

ABSTRACTS – POSTER

M. ANDALORO | C. BORDINO | P. POGLIANI | D. SGHERRI

The UNITUS activities in Cappadocia, Turkey

The University of Tuscia, Viterbo (Italy), has been working in the territory of Nevşehir since 2006, conducting the research mission “Rock painting in Cappadocia. For a project of knowledge, conservation and enhancement”. The mission, directed by Maria Andaloro, enjoys the support of the General Direction of the Ministry of Tourism and Culture of the Republic of Turkey and of the Archaeological Museum of Nevşehir; it is also tied to a current PRIN project (Italian National Relevance Research Projects).

The research has been carried out following an interdisciplinary methodology, which links humanistic knowledge with scientific and technical investigations and with latest developments in new technologies applied to cultural heritage. Consequently the team includes art historians, archaeologists, chemists and photographers from Tuscia University, architects from the University of Florence and Rome, geologists from the University of Calabria and speleologists from the Centro Studi Sotterranei in Genoa.

The work of Tuscia University has followed two main guidelines:

Survey: through the analysis of a large group of churches in the region, we aim at the implementation of a database on mural paintings and mosaics in Asia minor from the 4th to the 14th century. This database, that we have formed since 1996, within a project carried out in the territory of South West of Turkey, is devoted to several aspects of painting: constituent materials, technics of execution, status of conservation, but also iconographical themes and stylistic paths.

Two projects of knowledge, conservation and valorisation: since 2008 we have been carrying out the study and restoration of the pictorial decoration of the church of the Forty Martyrs in Şahinefendi; since 2011 we are also taking part in a project for the conservation of the paintings in the Tokalı Kilise in Göreme.

In Göreme the two routes of our work are particularly connected. Since 2012 campaign, in fact, the survey is focusing on the area of Göreme Open Air Museum and on the surrounding valleys of Göreme and Kiliçlar.

Our goal is the realization of a comprehensive study of all the painted churches in this area, with an eye firmly anchored to the indissoluble union between the natural landscape, excavated buildings and paintings. We aim at an in-depth knowledge of the pictorial decorations and at a better understanding of civil and religious functions of rock cut buildings and of the phases of development of the cave settlement.

Within this work, correct documentation through digital survey and digital photography is a fundamental base for knowledge, conservation and valorization.

The creation of 3D models, in particular, will display the paintings in the excavated churches that host them, allowing a deeper and clearer knowledge of the rupestrian habitat in all its components. It will also be very useful for the realization of innovative instruments of fruition, suitable for a

presentation of the rock monuments and pictorial decorations scientifically correct and diversified according to different communication levels: virtual reality installations and other multimedia products for the visitors of Open Air Museum.

Keywords: mural painting, rupestrian, Turkey, digital survey, restoration

F. CONVERTI

Strategies for the conservation of heritage: Historic sites in Campania

The objectives of the research with the poster,

Cultural heritage is undoubtedly a fundamental point of reference for modern society and needs to be preserved for future generations. Therefore, it is essential to develop methods and tools that can provide effective protection for cultural heritage and can facilitate their use. The objective of this special session is to bring together researchers and practitioners working in the field of cultural heritage and processing of digital images.

Preserving a cultural equivalent to defend the roots of its historical identity. Of particular interest is the preservation of archaeological sites, historical centers but also of the square or the individual monument that present distinctive features of an age at which we consider with admiration. Looking to cultural heritage in architectural sense opens two strands of thought: keep or intervene? The key lies in the resolution of the two aspects that are seemingly distant, can converge by giving the property in question, a value-added action but making it usable while preserving the good in an optimal way so as to ensure it for future generations.

Keywords: Heritage, landscape, Unesco

C. CRESCENZI | G. GIUSTINIANI | M. SCALZO | G. VERDIANI

The Cappadocia landscape and its relationship with the rupestrian architectures

In Cappadocia the rich shapes of the stones have been the place where houses, churches, castles, farms, monasteries and tombs were sculpted across centuries. The link between nature and architecture here has become continuous and very articulated, with the humanity to take advantage of the shape of the places to create defensive systems and churches and castles with their spectacular appearance. The delicate condition of this area creates an important need for correct documentation. It seems impossible to imagine a possible full restoration and preservation of such fragile system as a whole, so the documentation is the only way to preserve at least a rich digital image of the state of these places. After the extended approach to the rupestrian architecture developed along the CHRIMA European Project, our research group had the opportunity to bring on this research his experience with renewed interest in the PRIN contest (the acronym means National relevance research project and indicates a project financed by the Italian "University and Research Ministry"). So in this new project, the task of our unit will be the reading of the relationship between the rupestrian architectures and the landscape, using the tools of the digital survey, of the digital modeling, of the advanced photography and of the computer graphic to empower the basis of the research and develop both a complete documentation and some intervention hypothesis. The keywords of this documentation are: 3D laser scanner, Digital Photography (from panorama shooting to SfM), 3D digital modeling and last but not least 3D prototyping to allow access to inaccessible places. This poster will present the state of

advancement of this research in the 2013, after two survey campaigns in Turkey and the first year of data treatment.

Keywords: modeling, rupestrian, Turkey, digital survey, landscape

A. DEGRAEVE | D. BIBBY

ARCHES (Archaeological Resources in Cultural Heritage – a European Standard)

This project, carried by 8 partners from 7 different countries, is funded by the EU Culture Programme 2007-2013 – Strand 1.2.1. Cooperation measures of European Commission (Agreement number 2012-1399/001-001). It started on June 2012 and runs till May 2014. The purpose of the project, born within the Archaeological Archiving Working Party of the European Archaeological Council (EAC) (<http://www.european-archaeological-council.org/>) is to agree a European standard that will benefit cultural heritage practice and management in Europe and to produce a best practice manual and twinned web presence for the creation, compilation, transfer and curation of the products of European archaeology.

Archaeological archives consist of all material deemed worthy of retention generated by any type of archaeological project. This includes the historic artefacts as well as the written, drawn, and photographic records and the digital data about the site and its associated finds collection. The successful preservation of the archive for the future benefit of the people of Europe depends on the implementation of best practice in creating, compiling, transferring and curating the results of every archaeological project.

The proposed manual will bring together the recommendations of the country and state-specific standards and guidance documents, provide standards where none currently exist, and provide guidance for implementation of shared best practice in all the participating countries. The EAC Archaeological Archiving Working Party will guarantee the sustainability of the manual and web presence thus ensuring that they remain current and relevant and will motivate the formal adoption of the standards recommended in the manual and web presence by the EAC itself as a means of monitoring good practice in the management of archaeological archives.

For more information see: <http://www.european-archaeological-council.org/13-0-Archives.html> and <http://archaeologydataservice.ac.uk/arches/Wiki.jsp?page=Main>

F. DIARA

New software and technologies applied to documentation and communication of Cultural Heritage

In the last seven years researchers have been using the stereo-photogrammetry technique to achieve more data in comparison to the monoscopic photogrammetry. The stereoscopic vision is achieved by two or more pictures taken from different position (with at least the 60% of overlapping between the two shots), unified in a second step with common spots. Using this method it is possible to detect more levels of the object's history and conduct through mesurations in real time. Many professional and semiprofessional photogrammetrical software based on the image processing have therefore been recently developed, for archaeology, architecture, and more in general the restoration and preservation sector: ZScan (Menci Software), Z-Map (Menci Software), UMap (Menci Software),

Photomodeler Scanner (EOS System), Orthoware (Metria Digital S.L.), Image Master (Topcon), Photoscan Pro (Agisoft), Image Modeler (Autodesk). These software allow to produce several analysis from the photos: orthophotos, D.E.M., 3D reconstruction geometrically correct, coordinate system creation, metrical inquiries, 2D and 3D drawing on models. Every software, even if usable in several disciplines, has his peculiarity and specific function, so that the ideal study of a site, building or object can be achieved combining more techniques and software, trying to use the bright sides of each one. The rapid development is making possible also to do photogrammetrical 3D reconstruction with any mobile device (smartphone or tablet), a binding news that is getting closer a far more numerous public than before. The aim of my research was to compare and study the various software in their application to the Building Archaeology, in order to suggest which software fits best for which project, and to suggest how to combine them.

Keywords: Software, 3D modelling, image processing

G. DIONISIO | P. KRUKLIDIS

The Trojan War Myth as a didactic project: Innovative proposals for the understanding of the history

Educational projects and innovative learning methods are very much in demand today for the first level education. These methods enable children to better understand school subjects, such as history, through images, games, video and animated stories. These elements increase the interest in children and allow a better understanding of the topics.

This poster is created to suggest a different approach to Greek mythology. The chosen period revolves around the Trojan War and the purpose of this representation is to provide an immediate learning for children and young people through images created to describe the setting. The suggested project, however, is also designed for adults, providing a new type of communicative approach for scholars and experts. The poster is also an example of museal panelling which aims at a general public.

The panel is divided into two levels: the learning designed for children (pink colored) is strongly based on the images that are placed in relief with respect to the bottom; the part for adults, closely linked with the one for children, is accompanied by technical explanations concerning the images implementation and their relevance from a historical and archaeological point of view.

The available technical tools in a historical reconstruction are varied and highly innovative: an extensive bibliographic knowledge, a range of knowledge learned in the field, the affinity with the freehand drawing and graphics tablet and the use of 2D and 3D software are all fundamentals to the creation of the reconstructions used in the educational and technological field.

In the selected illustrations, an important role is played by the elements that will make up the image. Therefore, not only information will be provided by the single figure dominating the scene, but all the objects used to produce the reconstruction will play a key role.

The two levels of the poster, besides the different color, will also have a different printing technique and will be connected to one another by graphic elements.

Keywords: Trojan War, Educational projects, museal panelling

St. EICHERT | V. JANSKA

OpenATLAS - an open source database application for archaeological, historical and spatial data

OpenATLAS is a database application for the work with archeological, historical and spatial data. The development is currently at an early stage and carried out by a small team from the University of Vienna.

It is open source, cost-free as well as easy to install and use with no special computer knowledge needed. It is designed for users within the scientific community in the field of cultural heritage, that seek an applied database solution for organizing and analyzing their scientific data.

OpenATLAS runs on all common operating systems (Linux/Mac/Windows) and can be configured for single-offline users as well as it can be connected to a server for a multiuser environment.

It is powered by Postgresql and PostGIS (or Sqlite and Spatialite in the file based-offline version) and therefore also connectible to every common GIS program like for example Qgis or ESRI's ArcGIS.

OpenATLAS implements an object-oriented data-model and mainly deals with 4 types of information:

Physical entities like archaeological sites, finds, stratigraphical units

Human entities like persons, groups of persons and institutions/organizations

Temporal entities like activities, events, phases, actions

Sources like articles, images, documents, that refer to other entities

Entities of various classes may be related to other entities and OpenATLAS automatically creates links between them if necessary. Therefore it uses classes and properties from the CIDOC Conceptual Reference Model of the International Council of Museums. This provides interoperability and compatibility to other projects and databases that use this standards too as well as it offers a high flexibility and the possibility of adaption for individual purposes.

OpenATLAS aims to be an applied database solution for information from the field of cultural heritage - especially for archaeological data. It combines an easy to use graphical user interface – that also beginners and non-computer-specialists can work with – with a powerful database-backend. It offers a high GIS- functionality and implements international data-standards. As it is open source it can be developed further for various other purposes.

Keywords: Database, GIS, open source, usability, CIDOC-CRM

V. FANTINI

Art Nouveau and abandon in Italy, documenting the Built Heritage before its loss

"This research is about the analysis of the abandoned building Art Nouveau in Italy (where this artistic and architectural tendency was named "Liberty"), starting from the study of the evolution changing of the appeal in this architectural style. Liberty was popular only during the period from the end of 1800 to the first decades of 1900. The Liberty was characterized by a marked linear style and elegant decoration; it became quickly the main style of the growing bourgeoisie. This research would be oriented to examine the reasons because these particular buildings didn't acquire the "charm of ruin" after their closure and because they often suffer from a completely abandon without meaningful chances of recovering. Buildings like the "Terme del Corallo" (Livorno), the glasshouses (Montecatini) or the "Villa Zanelli" (Savona) can be clear samples of this condition. The methodology for the analysis

of this Heritage at risk will be developed using the photogrammetric survey, using both a traditional 2D approach and the SFM solutions. The aim will be a better understanding obtained using fast and discrete techniques (a lot of these buildings are left to themselves and often preserved from the intervention of the public interest) and the creation of an archive of this objects. The observed buildings will be chosen from a vast territory and their survey would be a possible reference for a conservative intervention or at least a documentation of something lost. Each single example will be considered inside its urban contest taking into account the main changes happened in time. The project will use the research as a process for a more sensitive design approach, hoping to encourage a retrieve of this Built Heritage. All the data are prepared to be integrated in specific social networks like www.impossibleliving.com for their maximum dissemination."

Keywords: Digital survey, archives, Liberty, photogrammetry

P. FORMAGLINI | F. GIANANTI

The fortifications of Granada: Bab al-Difaf. The documentation, survey and new hypotheses of the forgotten monument

Cadi? Los tableros? Bab al difaf? There are so many names for a single enigmatic monument along the fortifications of Granada. The city of Granada is full of monuments, which are known for their beauty all over the world, whose meaning and role within the urban city planning is well known and easily readable. There are some examples which have not found yet a specific location and a role within the "system" in the city and they are still waiting for a correct interpretation. In major part their "suspended" character part is caused by incompleteness of the State's archival records, by degradation of the monument and also by missing oral testimony, which keeps alive its history and its location in the city.

What people know as "puente de Cadi," is an example of the above mentioned conditions and this monument from Ziri period, placed between the Islamic district of the Albaicin and the Alhambra, raises still a lot of interests among the group of researches.

So how is it possible to study and analyze this "forgotten" monument? Our goal was to reach a 3D model which can be analyzed in detail. The main problem to resolve was the accessibility to the site because between the monument and the main street there the river Darro: the solution could be to use a laser scanner technology, but due to its excessive awkwardness, it was not possible. That's was why we chose to work with the aid of software SFM (Structure from motion). This software uses photos and it is able to generate 3D models. To achieve a very accurate 3D model we had to take more than 4000 photographs and with the help of many software including Agisoft Photoscan, Inus Rapidform and Geomagic, we were able to achieve a mesh model with approximately 100 million of faces, then we shranked the model approximately to 15,000,000 faces, ready to be handled by desktop computers.

The use of so accurate digital model allowed us, simultaneously with researches made in archives and by collaboration of researchers of LAAC of Granada, to reach a plausible virtual reconstruction of the door of Bab Al-Difaf that can be used for a development of further hypotheses of study.

Keywords: Bab al-Difaf, Granada, SFM

J. GSPURNING

Graffiti @ Cultural Heritage

Hardly any distinct feature of urban environments and the society living in such environments is discussed for so long and controversially as the phenomenon of street art and graffiti. For the mainly juvenile supporters of the movement graffiti simply is a nowadays widely accepted possibility for artistically freedom of scope, whereas their opponents are putting graffiti on the same level with vandalism, violation of property rights and damage producing an impression of blight and gang activity. On the other hand the city of Graz is well known for its cultural heritage which every year attracts a lot of visitors (European Capital of Culture 2003); considering this commercially important interrelation the people in charge are forced to do their best in heritage documentation and management. As a matter of fact there is an area of conflict established by the intentions of the persons involved: the graffiti artists, the citizens, the politicians and the tourists. Unfortunately until now there can be stated a lack of research work describing and analyzing the interactions taking place in the surrounding of historical buildings. Therefore the proposed paper discusses the appearance of the graffiti phenomenon in the main touristic zones of Graz by the means of GIS and Spatial Analysis toolboxes. From the methodical point of view, the workflow consists of three different work packages, data description and acquisition, data model building and finally analysis and visualization: The first step is done by conducting preliminary studies allocating (local-context-) knowledge about the characteristics of urban graffiti, the features representing architectural heritage and the tourists routes; the results of this step can be used for the development the underlying GIS-database model (phase 2) holding all project-relevant spatially referenced data (conventional attributes, pictures etc.) which have to be analyzed in step 3 by the toolboxes of the process model. The latter employs pattern analysis and the delineation of hot spots providing a wide range of graffiti related insights: Local patterns of different graffiti types, preferred undergrounds, styles and graphical data (i.e. signs) can be compared and overlaid by touristic and socio-economic data. Finally, the evolution of appearances and appearance patterns can be visualized and mapped.

Keywords: Graffiti Cultural Heritage, GIS

R. GYÖRKE

Archaeometrical investigations of finds found in the Late Avar age bloomery workshops at Bátaszék-Nagyorros (County Tolna, Hungary)

The goal of our archaeometallurgical research is to process the material of archaeometallurgical sites by interdisciplinary methods and make them available for research, creating appropriate bases in Hungary for more comprehensive processes relating to metallurgy of iron and archeology.

In the Hungarian Transdanubia, more than 50 Late Avar age and Early Middle age archeological sites connected to iron metallurgy are known. In Bátaszék some Avar age bloomery workshops were bloomery excavated in 2008. The purpose of the research is to demonstrate the activities of the iron-metallurgists in Hungary during the Late Avar period (AD 8-9th century) through complex analysis. Based on the natural science analysis of the iron slag the iron-slag typology, the 7-9th century furnace typology, the reconstruction of the work-organization, the technology of the utilization of minerals and

the quality of ores will be presented. The analyses shall be carried out at the Department of Mineralogy, Geochemistry and Petrology, University of Szeged, headed by Dr. Krisztián Fintor. Using geographical information methods we illustrate the physical-geographical and geological environment of the site, which enables that Avar age iron-metallurgy sites can be represented on the map.

The archaeometrical analysis of the finds from the Migration and Early Middle ages raise questions of social and economic history. Archaeometallurgy analysis is required to create a true picture on the technical-technological background of the activities in iron metallurgy, namely the analysis of the chemical composition of the finds.

„The research was carried out within the frames of the special project “National Excellence Program – The convergence program for the development of the system providing personal support for domestic students and researchers” ID TÁMOP 4.2.4.A/2-11-1-2012-0001. The project is implemented with the support of the European Union and the European Social Fund.”

Keywords: Bloomery, Late avar, Hungary, Archaeometrical analysis

M. HORŇÁK | J. STREHLÍKOVÁ | J. ZACHAR

Towards a photogrammetry as an archaeological documentation method. The case study of Čachtice castle

The Čachtice castle is a coherent ruinal architecture situated on the top of a limestone peak (375 m) within the Čachtice carstic hills in Male Karpaty mountains between the villages Čachtice and Višňové. Former frontier castle served as a control point on the cross way from the Myjava valley to Váh valley. According to written sources castle is supposed to have been erected after the year 1260 under the patronage of Kazimir of the Hunt-Poznan house.

In 2012 the project of castle restoration and statical treatment was launched. Restoration works made archeological excavations of the concerned castle parts inevitable. Excavations were limited to specified areas subjected to earthen activities mostly as a part of the masonry statical treatment. During excavations bottom pavement levels of existing architectures as well as architectural fragments of earlier castle building phases were discovered. Remedation project together with archeological and architectural research continues in 2013.

Prior to the excavation beginning basic measurement conducted with GNSS Rtk rover was conducted to obtain point field in national coordinates (S-JTSK). It was applied as an fast and efficient robust low cost method for documentation purposes of 2D and 3D photogrammetry. Prime photogrammetry output were rectified ortophotoplans determined for CAD vectorisation. 3D photogrammetry served extra for georeferenced digital elevation model generation of particular trenches . Photo acquisition was done with unmanned aerial vehicles (AUV), pole areal photography (PAP) and hand handled camera. Data processing was based upon intersection method "Structure from motion" using SW Agisoft Photoscan Pro.

Keywords: Čachtice, castle, medieval period, photogrammetry, structure from motion

I. HUVILA

Archaeological information in the digital society

Digitisation of archaeological information and cultural heritage assets has been one of the cornerstones of the digital society debate. However, at the same time when nations have made considerable investments in the digitalisation of archaeological heritage, we know very little about its implications to the usability of archaeological information for different stakeholder groups from citizens to researchers, museum professionals, landowners and property developers. We know a lot about technical challenges, but very little on how information practices influence the usability of information. The aim of the Archaeological information in the digital society project is to map the implications and opportunities of the digitalisation of information and information work in the domain of archaeology and material cultural heritage throughout the lifespan of archaeological information from the field to museums and community planning, and to develop and evaluate conceptual and practical methods and procedures for enhancing archaeological information work in the digitalised environment. The Archaeological information in the digital society project is divided to five work packages: 1) Information process and usability, 2) Collaboration, 3) Digital methods of analysis, 4) Information visualisation. The project addresses a series of significant recognised challenges within archaeology and, because of the broad societal implications of archaeological information from cultural heritage, museums and media industry to community planning (the legal requirements to protect archaeological sites and its consequences to infrastructure development and land use such as construction of houses, roads and railways), in the digitalised society as a whole.

Keywords: archaeological information, information process, documentation, presentation

L. LAI | M. SORDINI

3D documentation of a megalithic building in Sardinia

The research presented in these pages is about reality-based 3D modeling for documentation, archaeological analysis and communication of a prehistoric site called Nuraghe Oes. A "nuraghe" is a megalithic monument built only in Sardinia during the Bronze Age; Nuraghe Oes is a complex type of nuraghe, well preserved, composed by a three-tower bastion connected with a main tower. The first season of stratigraphic investigation revealed the need for a high-quality documentation of the archaeological site to preserve and to understand it better: we planned a complete 3D survey to create a high resolution 3D model using terrestrial laser scanning and close range photogrammetry. The use of multiple techniques was an essential requirement to produce a complete 3D model of the monument, but also it was the best compromise among geometric resolution, costs and time. Data processing was a timeconsuming operation performed using different kinds of softwares. From the points of view of documentation and archaeological analysis we produced CAD technical drawings that illustrate elevations, sections and plans as well as elaborating a measurable 3D PDF with the geometry of the monument: these products have been used both for preserving proposals by the Archaeological Superintendency and to perform archaeological analyses and interpretations. Furthermore, exploiting the objectivity of the 3D recording, we tried to propose a standard scheme for the analysis of different features of this kind of monuments in order to improve and rationalize the typological comparison between nuraghi. Lastly, we rendered and edited a video to

communicate the results of the archaeological research about the Nuraghe Oes: the short movie leads people into the monument through a virtual tour, showing aspects and peculiarities of the megalithic building.

Keywords: 3D modeling, laser scanner, photogrammetry, 3D documentation, archaeological analysis

F. MARINO | V. TROTTA | V. BORELLI

The integration of geo-referenced data in the landscape archeology: the case of the northern part of the Kroton's territory.

"...When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind...". With these words, the Scottish physicist William Thomson insisted about a concept dear to all men of science: to structure all the data of a scientific research as parts of a always verifiable, reliable and measurable series of elements, which range has to be, in the first instance, analysable and then interpretable.

This kind of scientific study is essentially based on the accuracy of information and data, as a principle also applied to those fields, such as archeology of landscapes, which are on the border between the humanistic and technological areas.

The case study of the northern part of the Kroton's territory, which is included in the scientific activity of the 'Filotteteproject', a project run by the chair of Archaeology and History of Greek and Roman Art of 'La Sapienza' University, presents various aspects of great interest coming both from the fields of archaeology and landscape studies.

The importance of this research lies in the application of methods, such as geo-referencing of archaeological data, that have led to substantial progress in the standard of accuracy of the documentation that, until 2010, was conducted in the Kroton area only with traditional types of survey studies (historical sources analysis and surface surveys with a low level of accuracy or even without any sort of cartographic reference).

U. MÜLLER | A. KLINGELHÖFER | J.-M. HAFNER

Georeferenced 3D Laser Scan – Correct Documentation and Descriptive Visualization

Laser Scanning in medieval towns of Nürnberg, Würzburg and Schweinfurt

During investigations in ancient cities of Southern Germany by BfAD (Büro für Ausgrabungen und Dokumentationen Heyse) different types of laser scanning technologies were going to be used. The accurate documentation of architectural structures could be achieved by applying a FARO Focus 3D Laser Scanner. The integration of fixed points into the records enables the georeferencing of the scanning result. The record may also be used to extract data for CAD drawings and further processes. For more detailed information and also the documentation of finds an easy to handle Explius 3D Scanner appeared to be a suitable tool. Both methods result in high resolution mapping and visualizing of archaeological sites for presentation purposes.

In Würzburg the BfAD recorded the basement of "Platz'sche Garten", once a noble dance hall, and "Gebhard's Keller", a ninepins alley with a taproom. Both locations had been situated near the

medieval town centre and were destroyed by bombs during the Second World War. After the bombing the still intact cellar system remained untouched for decades and had then be recovered and documented. Parts of the basement functioned as an air-raid shelter and showed precautions written on the wall which are clearly visible in the scan record. The laser mapping of the basement and the reference points allowed a total 3D reconstruction. Through processing the datas with AutoCAD software different isometric views could be produced. The records were georeferenced with a total station on the surface. During comparable investigations, e.g. in Nürnberg and Schweinfurt, the fixed points have been produced by using a GPS. High accuracy of the measurements could be reached with correction datas o

f the mobile provider. The result of combining the applied methods offers different advantages and fulfills several requirements of correct documentation.

Keywords: 3D laser scan, GPS, EDM, medieval towns, urban archaeology

C. NERUCCI

Recording not to forget. A Post-medieval kilns' survey

Postmedieval kilns are archaeological structures document a producing activity actually disappeared; an exemplar case is the Certaldo area (nearby Florence), where the tiles and bricks' production was developed in the end of the XVII century and carried on until the 1950s', isolated from the industrial production. The kilns were owned by the great farm estates ruling the land, and they were used for the internal need of tiles and bricks in case of restoration, maintenance, building of new residence structures.

Notwithstanding the continuity of the use up almost until nowadays, and the still living memory of old local people, the Certaldo's kilns are left abandoned, and there's the concrete rick of loosing these capital witnesses of the productive cicle, a real archaeological witness were other sources are lacking. The kilns' material structures, without any protection, have been heavily trasformed and sometimes destroide, or in better cases they have been restored with intervention tha have erased their archaeological shape.

To record such structures, with the use of softwares that allow a 3D reconstruction, is the first step towards the safeguard and a porject for the preservation and the enlightenment of this alas forgotten cultural patrimony.

Keywords: Documentation, Record, 3D Recostruction, Cultural Heritage

A. S. ORTIZ MIRANDA | M. T. DOMÉNECH-CARBÓ | A. DOMÉNECH

Characterization of morphological and chemical changes at micro- and nano- scale in contemporary paintings treated with biocides

The growing problems of biodeterioration undergone by commercial artists' paints have increasingly required the application of biocide treatments on contemporary artworks. In most cases, commercial biocides, which have not been created for the purpose of being used in the field of art conservation, are applied in the dosages recommended by the manufacturer without control on the effects of their application on the artwork. From this, a study has been conducted aimed to evaluate the changes induced by the biocide on contemporary paintings of acrylic and PVAc type. Two biocides have been

considered, namely, Biotin T® and Preventol RI80®. Chemical changes have been identified by using FTIR spectroscopy and UV-VIS spectrophotometry. The morphological study at microscale has been performed by using optical microscopy and SEM-EDX. In a second step chemical and morphological changes at nanoscale have been characterized by using, at first time in the field of the analysis of artworks, the novel technique of electrochemical atomic force microscopy (ECAFM). Some of the most significant changes observed by microscopy were: appearance of spots and alteration of the brightness of the paint film, as well as, deposits of biocide. A notable delay in the coalescence phase of drying of the acrylic polymer used as binding media was recognized by means of ECAFM. Spectroscopic analysis results suggest that the application of the biocide causes a significant migration of additives to the surface from the core film. Acknowledgements.- Financial support is thanked to the Spanish (MICINN) R+D Project CTQ2011-28079-C03-01 and 02 also supported with ERDF funds. Research was conducted within the “Grupo de análisis científico de bienes culturales y patrimoniales y estudios de ciencia de la conservación” Microcluster of the University of Valencia Excellence Campus (Ref. 1362).

Keywords: biocide, acrylic paints, PVAc paints

A. PASQUALI | A. MANCUSO

Ancient buildings: digital survey and new hypotheses

Church of Ss. Giovanni and Reparata is located inside the ancient town walls of Lucca, Toscana, and it is an example of a multi-layered building, grown on an ancient roman domus and become a whole consisting in a Baptistery and a church. The first settlement church is dated at 754A.D. and after some evolutions has evolved to the current configuration and now is the subject of relevant Archaeology-Architectural studies, as well as some interesting discussions.

The Baptistery has had various incarnations: from a roman layout has probably evolved at first in a proto-Christian building and then in an architecture more suited to the needs of the urban evolution. The Poster presented focusing on the transformation of the Baptistery, will center on its first version, characterized by a central polylobate plan, up to confute the actual reading of the construction phases which is intended to indicate the presence of a Prime Baptistery on which was built the present. The research work is developed on the analysis of the walls and the comparison with the similar Baptistery of Biella, Piemonte, rare example of existing baptistery polylobated, built in the tenth century of an ancient roman domus. The result looks like hypothesis of the presence of a roman Nymphaeum on which developed the current configuration of Lucca at the expense of the presence of a Prime Baptistery. Using various survey methodologies as digital laser scanning and photogrammetry SFM, offers a different method of comparison by which to develop alternative hypotheses about the evolution construction of this monument.

Along with this we want to highlight the flexibility of investigation that allow digital techniques, supported by quick and easy production of digital models of comparison, setting an example of "correct documentation" through the intersection of cultural analytical methods, of their own architecture and metric survey.

Keywords: Polylobate plant, digital survey, Baptistery, Lucca, Nymphaeum

V. REITER

The architecture of the Bronze Age graveyard at Neumarkt an der Ybbs

Today Neumarkt an der Ybbs is a little town in Upper Austria. 3500 years ago it was a settlement area of a group we now call the "Věteřov Culture". We know a lot of settlements on hill tops and in flat country, but only a few graveyards of this culture. In 1997 and 2000 a burial ground was excavated by the Bundesdenkmalamt (F. Sauer) in advance of gravel mining. 92 bodies were found. They are buried in the fashion traditional in the early Bronze Age in Lower Austria south of the Danube: the burials are in a crouched position, the women's' heads lie in the south, those of the men in the north, both look towards the eastern sun. I am presently analysing this graveyard and preparing it for publication.

The architecture of the necropolis will be paid special attention, alongside the usual analysis of the features, attire, grave goods and skeletons. The graveyard is divided into eastern and northern sections by a broad central area. In the northwest there is an area where extraterritorial guests were buried, evident because of their attire and the skeletons' characteristics. To the west there was a house, probably a part of the Bronze Age graveyard. I will emphasize an exposed area in the northeast, which is unique in this period in Lower Austria: in the centre is the head of a 40 year old man. This head deposit is bounded by two richly decorated women, all three burials are arranged along a southwest-northeast axis. Evidently this is a funeral assemblage of exceptional significance. We (the anthropologist K. Grossschmidt and I) are now searching for the remains of this man, who's head was cut off 1500 B.C. (3150 ± 30 BP = 1490 – 1470 cal. BC) and who was treated it in such a special way.

Keywords: Bronze Age, Věteřov Culture, graveyard, head deposit

K. ROSIŃSKA-BALIK

(Re)constructing the past: 3d modeling of the Roman Temple. From theory to virtual reality.

Archaeology is a discipline that's constantly enriched by new technology for result presentation. Willingness for visualization forces archaeologists to spice their results with as realistic and approachable graphics and computer reconstructions as possible.

In my poster I would like to present a process of creation of a virtual reconstruction of Divi Iulii Temple at Forum Romanum. This virtual model of the temple I produced based on results of archaeological research carried on by Otto Richter at the end of XIX century but also by using Vitruvius' On Architecture and comparison studies of different buildings of this period as well as using portrayal of this temple on Hadrianus coins. The reconstruction was done by using architectural software such as AutoCad and 3D Studio Max.

The constructions created in virtual reality allows grasping objects in their original form, not frequently available for us, or lost as a result of invasive research method, which undoubtedly is archaeological prospection. In my poster I would like to point out how different sources can provide us information which put together might give, in theory, as much close to historical reality image of the past. This way of presentation by using new technology enabled me to applying it for teaching e.g. interactive lessons of ancient architecture, history of architecture as well as history of particular building.

Keywords: reconstruction, 3D modeling, virtual reality

F. SCHÄFER | M. TROGNITZ

IANUS - a national digital archive for archaeological and related data in Germany

The poster will give an overview about IANUS, a new research centre in Germany for digital data from archaeology and classical studies. The project is funded by the DFG and is currently under construction. Since September 2011 its future tasks and duties are being defined and financial as legal frameworks are discussed. Once established, IANUS will be comparable to eDNA in the Netherlands and ADS in the UK.

Primary goals will be the long-term preservation, the dissemination and the aggregation of digital research data. For all these aspects the issues of data management, data quality, data documentation, data storage and data re-usage are crucial questions. Thus the poster will present the fundamental concept of a data lifecycle and will explain why it is important to archive and disseminate data.

Furthermore, it will answer some key questions about IANUS:

- What is it?
- Why and for whom does it exist?
- Which services will be offered?
- When can it be used?
- Who is involved in it?
- What are the present actions?

One focus, as a main service, will be new IT-guidelines which comprise both accepted standards as well as best-practice examples and which IANUS is going to host and promote within the German community. Hopefully these will help data producers to improve the documentation of their data, to enhance the consciousness for the quality of their data and to conduct sustainable data management.

Keywords: data repository, archiving, documentation

G. SPENCE MORROW | P. R. DUFFY | L. TOSTI

Virtually There: Offsite georectified photogrammetric processing as onsite strategic excavation resource

With photogrammetric software becoming increasingly available and applicable to the archaeological research community, the three dimensional output produced by these programs has the potential to extend beyond a merely documentary role to serve as a fundamental and ongoing aspect of excavation methodology. As a technique limited only by the computing power at hand in the field, photogrammetric processing of photographs is most often an aspect of post-excavation data management, and as such, it is seldom exploited as an integral component of excavation strategy. By combining daily onsite photography and geospatial mapping of fragile cremation urns and inhumations at a Middle Bronze Age cemetery in the Körös Basin in eastern Hungary with offsite photogrammetric processing and georectification, the method and workflow presented in this paper demonstrates the potential of photogrammetry to serve as a powerful resource during the process of excavation of

archaeological contexts. Advances in cloud computing and automatic processing will no doubt make this method of near to realtime photogrammetric documentation an independent process reliant on mobile devices in the near future, and a series of suggestions will be put forward in the present paper in light of the successes and challenges that came about during the experimental collaborative system developed.

Keywords: Photogrammetry, cloud computing, burial excavation techniques,

W. SÜß

Rapid data generation on large areas

"With many supporting activities in the archaeology, SENSYS also realized an archaeological survey in La Olmeda Spain. The farm land around the old Roman villa had to be scanned with minimum budget and in shortest time.

SENSYS used a mix of a 16 channel gradiometer magnetometer systems with RTK DGPS, a 5 channel gradiometer magnetometer system and an active system EMD1 to generate highly accurate large area maps within shortest time.

SENSYS covered 28 ha in 2 days, having a measurement point grid of 10 by 10 cm and a georeferencing of every measurement point within 2 cm. The big advantage in comparison to smaller or hand held devices is the stability of measurement data from all the probes within the systems. Using 1-channel systems requires walking straight lines. Having no RTK DGPS with base station requires exact measurement of track lengths in order to properly spread the measurement data over the length of a track. All this becomes obsolete with the SENSYS multi channel systems and generates highly accurate magnetometer maps from large areas. Thus giving the possibility to analyze in very low nT-ranges as well as analyze the correlations of large but nearby structures.

With the comprehensive SENSYS software MAGNETO, all data from the La Olmeda project could be put into one map and revealed a desiccated river as well as some roads and building structures."

Keywords: multi sensor system, magnetometer, DGPS

H. TERAMURA | H. YAMAGUCHI | T. USAMI

Archaeological Research and Digital Documentation of Dabusia tepa in Uzbekistan

Our project focuses on an archaeological site of Dabusia Tepa. It is the largest archaeological site next to the well-known site Afrasiab tepa in Samarkand, Uzbekistan, and one of the most important sites in Central Asia. It has always been one of the central city closely involved in cultural exchange and trade between the East and the West.

Excavation and documentation of Dabusia Tepa have been carried out for eight years, from 2005 to 2012, by Institute of Archaeology of the Academy of Sciences of the Republic of Uzbekistan and Japanese research group of Archaeology. In this poster, we mainly intend to give a clear description of the results of this international joint research.

In the research, we used several kinds of techniques; data acquisition of remotely sensed image, application of GPS and total station for topographical survey, photogrammetric techniques, 3D scanning and so on. While each individual technique is not new, combining these ones is beneficial to

documentation. So, on a basis of the exact combination, we carried out the continuous documentation of the excavation sites, finds, etc. The poster will show the detailed workflow and the result of it. In addition, the project put an emphasis on sharing various kinds of the data captured with documentation and information extracted from them effectually, making the most of GIS. This point is essential to not only the archaeological study but also the work of Cultural Resources Management, and it is important that both researchers and the public are able to make use of the data (or information) according to their interest. We will also suggest the plan in this poster.

Keywords: Dabusia Tepa, Excavation, Digital Documentation

K. THÖMEL | A. GROTHE

The “Large Jewish Courtyard” in Berlin - Applied Methods on Site

The excavation undertaken in the historic Centre of Berlin has the aim to locate the medieval Jewish residential area. Evidence of a gardening area to supply the settlement of the 13th century in the core of the later Berlin city nearby the oldest market place shed light on the early development to a medieval city. During the late 13th, 14th and 15th subsidiary building and workshops were aligned on rectangular shaped lots of land facing westwards to the Jüdenstrasse (Jewish Street) and eastwards to the Klosterstrasse. After the Thirty Years War the area was rebuilt by an early modern ensemble grouped around a small central yard which was only destroyed during WWII.

The recording of single contexts is multifaceted. On our poster we will point out what kind of documentation is used: 3D measurements by Total Station, printed out and hand coloured on-site as well as photogrammetric images. Prominent features like the souterrain of a late medieval building are documented by 3D Laser scanning. The huge amount of digital photos is stored on different data backup systems.

Using predominantly digital methods of documentation is an effective way to enhance (field)work flow on site. Moreover, quickly accessible daily updated overall plans and small scaled plans of specific contexts are essential for scientific research.

Keywords: Berlin, digital documentation, urban archaeology

R. WEßLING | J. MAURER | A. KRENN-LEEB

Structure from motion for systematic single surface documentation on archaeological excavations

By the use of archaeological standard equipment (measurement unit and camera) structure from motion approaches offer an affordable, easy to use and accurate documentation method for stratigraphic excavations. However, it is still not applied in a frequent and systematic way.

In the well preserved Late Neolithic settlement Kleiner Anzingerberg/Meidling im Thale in Lower Austria structure from motion has been used intensely for single surface documentation. The commercial software Agisoft Photoscan was applied for fully automatic calculation of intrinsic and extrinsic camera calibration parameters, for creation of three dimensional point clouds and for generation of photorealistic surface models using multi view stereo algorithms. The models have been transferred to a GIS environment which is used for visualization and data management purposes. By arranging and displaying the models according to their stratigraphic positions a four dimensional virtual

reality is created through which the user can move interactively. Thus this method of digital preservation allows an objective and verifiable documentation of archaeological remains, which makes them an excellent basis for further interpretation.

To receive accurate results special attention has to be paid to the process of data acquisition: next to high image quality and good light conditions high stereo coverage of the images is obligatory. To archive this, ground based aerial photography was put to use at the site Kleiner Anzingerberg. A photo crane and telescopic pole served as camera platforms for the generation of serial vertical and overview shots. Images that have been taken in this way can improve the accuracy and point density as well as the computing time required to build the models.

Keywords: structure from motion, documentation, pole aerial photography

M. WHINCOP

Do indigenous Australians own the past: the lack of data standards in Queensland cultural heritage management practice

As a cultural heritage practitioner working in Queensland, Australia, I am often frustrated by the lack of a reliable and exhaustive central archive and database of indigenous cultural heritage sites and previous archaeological investigations. While an Aboriginal cultural heritage database and register does exist, the state legislative framework does not require the registration of identified sites within the database. The legislative framework leaves the onus on indigenous communities as recognised custodians of a site to decide if a site should be registered. More often than not, sites are not registered. The result is a database that is fragmentary and wholly unreliable; those sites that are recorded are not recorded in any detail. Queensland's legislation is simply inadequately designed to protect the cultural heritage, it is instead used more as a social mechanism for empowering Aboriginal communities. I will argue in this paper that a different legislative framework is required to adequately protect and manage Australia's indigenous cultural heritage for future generations of ALL humanity.

Keywords: cultural heritage indigenous standards

M. BLOCK | B. DUCKE | M. KUBBUTAT

The flying archaeologist

Unmanned Aerial Vehicles (UAV) constitute flexible and low-cost carrier systems for photogrammetry and aerial surveys. Important archaeological use cases for this technology include 3D site recording, the production of ortho-rectified aerial imagery and the derivation of digital elevation models. However, ease-of-use and stable flight operation, especially in severe weather conditions, remain challenging issues, as do carrying capacity and battery life. Our video showcases hardware produced by the "Archaeocopter" project (www.archaeocopter.de), a cooperation of the University of Applied Sciences Dresden, the state heritage management authorities of Saxony, the Free University Berlin and the German Archaeological Institute. We show live-action footage from historical sites in Saxony, Germany, that demonstrates the agility and the precision of control that modern UAV hardware can provide. We also demonstrate the data processing toolchain that turns video footage into accurate, high-resolution and true-to-scale 3D site models. Computational complexity is alleviated by GPU-based processing that enables rapid previews of the 3D models, allowing the operator to plan optimal flight paths on site. As our video will show, the Archaeocopter has generated considerable media interest and has done a formidable job in bringing together archaeology, heritage management and computer sciences. We hope that you, too, will be captivated by the elegance of UAV-based site recording and will enjoy the spectacular views of historical sites, as seen through the eyes of the Archaeocopter.

Keywords: drone, 3d-reconstruction, archaeology

F. CERBELLA | F. CAPONI

Contemporary architecture and ancient suggestions, the Louis Kahn's Hurva Synagogue project

The Video proposed here consists in the reconstruction of the Louis I. Kahn's first proposal for Hurva Synagogue in Jerusalem (the project was developed between 1968 and 1974). Kahn was used to incorporate elements of the ruins into most of his architecture, in 1967 he received a commission to replace the destroyed synagogue called Hurva, which name can be translated from the Hebrew - marvelous coincidence- in the word "ruin". For Kahn, this project presented an extraordinary opportunity to express his most deeply felt ideas about architecture. It was his chance to build the great Jewish monument at the religious center of the new Jewish state, in the region where the three major Western religions were born. As the world's leading Jewish architect, Kahn was conscious of the huge responsibility of this commission. In this project it is possible to find the elements that characterize Kahn's architecture: a configuration of space as discrete volumes, complex ambient light and shadow, a celebration of mass and structure, the use of materials with both modernist and archaic qualities. Kahn also expresses his concept of wrapping ruins around buildings: "The new building should itself consist of two buildings, an outer one which would absorb the light and heat of the sun, and an inner one, giving the effect of a separate but related building...". The outer building of synagogue recalls some ancient monumental ruin, perhaps from Egypt, or even from some more

remote past now lost to history. The video shows the aspect of the whole composition, it focuses on the relationship with the ancient ruins, pointing out that these were the elements of inspiration for the project.

Keywords: Jerusalem, Israel, Ruins, Reconstruction, 3D modeling

A. FURLAN | P. GALIFI | S. MORETTI

Nero and the Domus Aurea

The reconstruction of the great fire of 64 AD, which destroyed the capital of the Empire, and the golden palace of Nero in a new production by Altair4 Multimedia: for the first time the misery and the splendor of the Eternal City at the time of Nero, reconstructed in 3D computer graphics.

From the crumbling insulae of the Subura to the sumptuous architecture of the Domus Aurea, from Nero's artificial lake to the Colosseum, from the Neronian porticoes on the Via Sacra to the glories of the Imperial Fora, from the imposing bulk of the Colossus of Nero to the architectural revolution of the Octagonal Hall: the spectacular and rigorous reconstruction in 3D computer graphics of the most ambitious work by a visionary architect.

Keywords: Ancient Rome Nero Domus Aurea

M. SCALZO | C. GIUSTINIANI

The strength of the images: a rupestrian church in Göreme (Turkey) as a symbol of heritage at risk

Meryem Ana Kilisesi (Kılıçlar Kuşluk) is a rupestrian church in the Göreme Valley. The director Pierpaolo Pasolini contributed to make it famous, shooting some scenes of his movie "Medea" (starring Maria Callas) inside the church. The church is in one of the typical calcareous cones that characterize the Göreme Valley; the narrow path leading to the church is contained in a ground fracture. The path crosses some rupestrian ambiances with ruined fronts, and then reaches the plan space which contains the entrance of the Church. The entrance is characterized by the typical horseshoe arc, which was once frescoed. Between the 13th and the 14th centuries, the floor plan of the church was very particular: while the floor was a unique room, the ceiling was divided into two barrel vaults. The bema was elevated through three stairs, and it was separated through a carved iconostasis with six arches and five columns. Only two of the three original apses are preserved. The internal walls were completely painted. A funerary parecclesion (with at least seven ground tombs) beside the church is now in communication with the church through non original openings. The study of Meryem Ana Kilisesi included the digital survey of the site through Laser Scanner, FARO etc. The point cloud was studied in order to verify and identify the original structure; some reconstructive hypotheses have been drawn, to highlight the original structure. The digital survey of September 2012 constitutes a useful support to monitor the cracks condition, which is by now very serious. The survey has been implemented with 360° pictures, which have been treated with software as PTgui and Pano2VR, to obtain views for virtual tours.

Keywords: Rupestrian, Church, Cappadocia, Digital survey, Multimedia

D. TANASI | F. GABELLONE | I. FERRARI

'Siracusa 3D Reborn'. An Ancient Greek City brought Back To Life

The ignorance or the mis-knowledge of the archaeological background of a modern city can negatively affect its economy and cultural growth, limiting attractiveness and spreading erroneous or distorted messages over media. The Sicilian case of Siracusa is definitely emblematic. Founded by the Corinthians in 733 BC, birthplace of poets and thinkers as Epicharmus and Archimedes, visited by many prominent figures of Greek culture as Pindar, Aeschylus and Plato, Siracusa over centuries became one of the most beautiful, influential and wealthy among the Greek cities of the Mediterranean basin, as the majestic temples testified. Nonetheless, regardless the historical background and the imposing visible remains of that past emerging everywhere in the actual urban area, Siracusa, since 2005 World Heritage site, has never played the role of quintessential archetype of Greek city both in the scientific literature and the mainstream.

Against this scenario a virtual archaeology project, undertaken by a team of scholars of the IBAM-CNR and The Arcadia University - TCGS, aimed to the overall digital reconstruction of Ortigia, the core district of the Greek Siracusa, produced a 3D documentary 'Siracusa 3D reborn', that represents a pivotal advance in the knowledge of the Greek background of the city.

In this perspective, the choice of providing 'passive' cognitive tools embedded with communicational and emotional components did not affect the scientific accuracy with which the reconstructive process has been carried out. Main monuments of Ortigia are described and analyzed in the context of a full 3D stereoscopic representation employing techniques of modern cinema industry for elucidating and explaining its historical and archaeological characteristics. The reconstructive workflow followed a meticulous methodological plan based on the published data and aimed to define a previously unavailable topographic profile of the city, portrayed in two main chronological phases, Archaic and Late Classical.

Keywords: Reconstructive study, virtual archaeology, 3D theater

R. VITAL | S. BERTOCCI | S. PARRINELLO

Digital Documentation of the archaeological site of Masada, Israel

This video is summing up the collaboration between three academic institutions (Shenkar College of Design and Engineering, Israel - University of Florence - University of Pavia, Italy) on how to properly create a digital documentation of the archaeological site of Masada. The technologies used for documenting the site are laser scanning, GPS and photogrammetry. A group of researcher and students worked with the different technologies to create a comprehensive database of the three-dimensional geometry and photographic material of the site. This project was partially completed in 2013 (the area of the northern palace was documented) and will be continued for the next 2 years to complete the documentation of the whole site. The point cloud that results from this documentation will serve as a raw data base and from there 2D drawings, details and 3D meshes will be extracted. This will be further developed into a 3D reconstruction.

Keywords: laser scanning, archaeological documentation

TUESDAY 12th November

14:00 – 18:00 | Wappensaalgruppe | Rathaus Wien

(this afternoon will be held in German!)

Free entry, visit the exhibition area, listen to presentations and lectures.

14:00 – 15:30 | Presentation of the Exhibitors

15:30 – 16:00 | Book presentation: M. Mosser – “Straßen und Plätze. Ein archäologisch-historischer Streifzug”

16:00 – 17:00 | Book presentation: M. Musilová – “Römische Denkmäler an der mittleren Donau von Vindobona bis Aquincum” (in collaboration with M. Kandler, V. Turčan , O. H. Urban and H. Zabeňický)

17:00 – 17:20 | Book presentation: Archaeolingua Verlag presents EAC (*Europae Archaeologiae Consilium*)

17:20 – 18:00 | Presentation “Cultural Heritage Cadastre” (Ukraine) and “WebPortal Wien Kulturgut und Open Government Data” (Vienna)

Book presentation

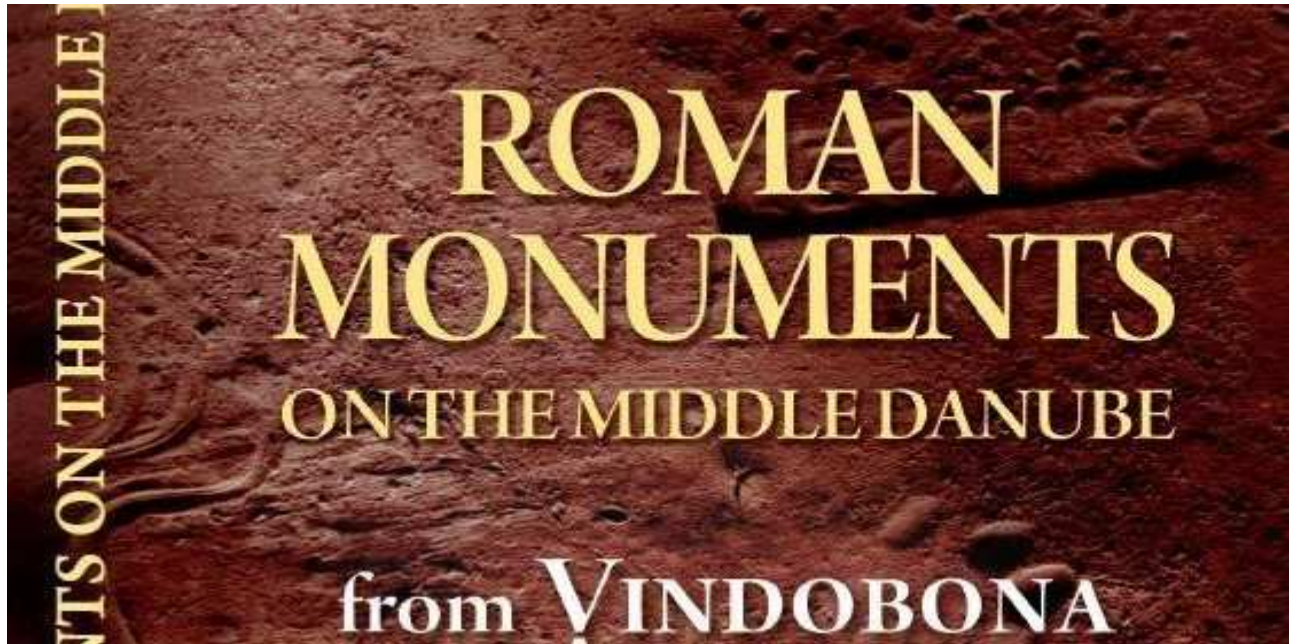


Straßen und Plätze. Ein archäologisch-historischer Streifzug.

Der siebente Band der Monografien der Stadtarchäologie Wien bietet ein spannendes Spektrum von zehn, aus einer Tagung hervorgegangenen Beiträgen zum Themenkreis der Entwicklung von Straßen, Wegen und Plätzen in Siedlungsräumen. Sowohl das städtebauliche Straßenkonzept als auch die stratigrafische Abfolge des Straßenaufbaus in überwiegend antiken, zentraleuropäischen Siedlungszentren – wie Köln, Trier, Vindonissa, Bregenz, Carnuntum, St. Pölten und Wien – stehen zur Diskussion. Ausgehend von der Antike wird auch die, gerade in den letzten Jahren brisante Frage

bezüglich der Kontinuität von Siedlungsstrukturen gestellt und so der zeitliche Bogen zum Mittelalter und zur Neuzeit gespannt. Präsentiert werden hier allerdings nicht nur die interessanten, historisch relevanten Ergebnisse archäologischer Arbeit, sondern es werden auch Einblicke in die neuesten Methoden der Geländerekonstruktion, der Digitalisierung älterer Stadtpläne, der Luftbildanalyse und des Airborne Laser Scanning gewährt. In diesem Zusammenhang wird klar vor Augen geführt, dass durch diese technischen Voraussetzungen Neubewertungen überlieferter Befundinterpretationen möglich sind.

Book Presentation



“Römische Denkmäler an der mittleren Donau von Vindobona bis Aquincum”

(in collaboration with M. Kandler, V. Turčan , O. H. Urban and H. Zabehlicky)

A publication in 4 language versions (Slovak, German, English and Hungarian) brings highly up-to-date information, presented untraditionally and innovatively. Incorporated into it are the latest scientific findings and interpretations of a team cooperation of renowned Slovak, Austrian, Czech and Hungarian authors. It includes easy-to-read maps, colored photographs and virtual digital reconstructions that are designed to allow fast and efficient orientation in terrain, and to provide a concrete vision of the original appearance of monuments.

- processing of archeological locations and museum expositions from the roman period in middle-Danube into a clear form of a pocket itinerary on the territory of Austria in Vienna, through southern Moravia, Slovakia down to Budapest in Hungary.
- informing of the public at large in Slovakia, but mainly abroad about the less known Slovak archeological monuments from the roman period that link us not just with the entire world of antiquity, but that also point out the importance of our territory as a European cultural cross-roads and highlight the continuity of archaeological localities across countries along the Limes Romanus.
- to support the efforts of the Slovak Republic , Hungary and Austria to have a collection of Slovak localities from the Roman period listed in the UNESCO World Heritage List.

Book Presentation

Archaeolingua Verlag ist "the official Publisher" der Reihe EAC (*Europae Archaeologiae Consilium*) und publiziert die Proceedings der jährliche Tagungen in Cultural Heritage Themen.

Vorstellung der neuesten Bände 2013 durch die Vize-Präsidentin des EAC Bord's Katalin Wollák Heritage Reinvents Europe. D. Callebaut et al.

Who cares? Perspectives on Public Awareness, Participation and Protection in Archaeological Heritage Management. A. Lagerlöf (Ed.)



The EAC Occasional Paper Series

The presentations of the heritage protection symposia organised by the *Europae Archaeologiae Consilium* (EAC) founded in 1999 brought a growing awareness of the issues related to landscape archaeology. The papers read at the symposia were published in the Occasional Paper series. In 2010, Archaeolingua Foundation and Publishing House began to collaborate in editing and distributing the series with the fourth volume, *Heritage Management of Farmed and Forested Landscapes in Europe*. Since then, four further volumes were published by Archaeolingua on the topics of remote sensing, large-scale excavations and archaeological heritage management. The 9th volume is under preparation and due to be published in 2014.

Presentation of Cultural Heritage Cadastre Ukraine



presented by Igor Yurchak, Chief Architect of the Kiev Urban Institute, Kiev, Ukraine, member of the Architects of the Russian Union

This afternoon shall initiate the forming of the regional Cultural Heritage Cadastre of Western Ukraine and further activity on the creation of an Interstate Fund for Cultural Heritage of the Danube Region by the following main points:

Presentation of the west region of Ukraine (most significant historical – culture places)

Informational exchange of historical and archeological dates, archives and operational dates.

Unification of the information on cultural heritage of the Danube region for creating the Unified Public Database

Forming the regional Cultural Heritage Cadastre for Danube Region (with the center in Vienna, with the most comprehensive archive of information about the region)

Adaptation of programs for collecting and classifying data with the development of uniform classification structure

Adaptation of the information available to the operational needs

Collection of information on the most important need of archaeological research in the region

Integrated regional development programs of archaeological research with the invitation of experts from different countries

Publications the reconnaissance completed archaeological research (list of completed but unpublished works)

Further fundamental research of published studies

Development of a program of fundamental and rescue archaeological work in Lviv

Culture exchange

Educational programs

Creating the Interstate Fund for Cultural Heritage of the Danube Region