

Mobilizing the Past
for a Digital Future:
**the Potential of
Digital Archaeology.**

27–28 February 2015
Wentworth Institute of Technology
Boston, MA

Funded by the



NATIONAL ENDOWMENT FOR THE

Humanities

Mobilizing the Past for a Digital Future: the Potential of Digital Archaeology.

27–28 February 2015
Boston, MA

Workshop Agenda

This workshop focuses on the emergence of digital archaeology – fully digital recording systems to create born-digital data in the field. The purpose of this intensive workshop is to bring together the leading figures in the field to discuss the use, creation, and implementation of mobile technology in advancing digital archaeology. Session themes are aimed to facilitate presentation and discussion on how archaeologists are using tablets or similar digital tools in the field, in the lab, and beyond, and how best practices are emerging and might be implemented across projects of different scale. The workshop will highlight the advantages and future of mobile computing as well as its challenges and limitations.

Workshop Organizers

Erin Walcek Averett, Creighton University (Omaha, NE)
Derek B. Counts, University of Wisconsin-Milwaukee (Milwaukee, WI)
Jody M. Gordon, Wentworth Institute of Technology (Boston, MA)
Michael K. Toumazou, Davidson College (Davidson, NC)

Event Sponsors



Workshop Program

*Events are hosted at Wentworth Institute of Technology
(unless otherwise noted).*

DAY 1: FRIDAY

- | | |
|--------------|---|
| 1:00–5:00 pm | Registration
<i>Alumni Room, Beatty Hall 103</i> |
| 3:05–3:15 pm | Welcome and Opening Remarks
Jody Gordon (Wentworth Institute of Technology)
Beatty Multipurpose Room, Beatty Hall 119 |
| 3:15–5:15 pm | Session I: App/Database Development and Use for Mobile Computing in Archaeology
<i>Beatty Multipurpose Room, Beatty Hall 119</i>
Moderator: Eric Poehler (UMass Amherst) |

Agenda: The session highlights the mobile apps and databases currently being used by various projects for field recording and spatial visualization and how the development of new apps will improve the integration of data and workflow in the future.

“If I Knew Then What I Know Now: Reflections on Custom Mobile App Development” 3:15–3:40
Sam Fee (Washington and Jefferson College)

“Beyond the Basemap: Site and Landscape Survey through Low Altitude Aerial Photogrammetry and Mobile GIS in the Andes” 3:40–4:05
Steven A. Wernke (Vanderbilt University), Julie A. Adams (Vanderbilt University), Eli Hooten (Vanderbilt University), Gabriela Oré (Vanderbilt University), Carla Hernández (Vanderbilt University), Aurelio Rodríguez (Independent Scholar), and Giancarlo Marcone (Proyecto Qhapaq Ñan, Ministry of Culture of Peru)

“Digital Imaging and Spatial Analysis in Archaeology: Problems and Prospects” 4:05–4:30
Brandon Olson (Boston University) and Manny Moss (City University of New York)

“Mukurtu CMS: Differential Access for the Ethical Stewardship of Cultural and Digital Heritage” 4:30–4:55

Michael Ashley (Center for Digital Archaeology, UC Berkeley)

Moderated Discussion

5:15–5:30 pm **Break**

5:30–6:30 pm **Keynote Lecture: “Why Paperless?: Digital Technology and Archaeology”**

Beatty Hall Room 426

John Wallrodt (University of Cincinnati)

6:30–8:30 pm **Speakers’ Dinner & Dialogue**

Watson Auditorium, Watson Hall

(This event is for program presenters only.)

DAY 2: SATURDAY

7:30–8:30 am **Registration**

Casella Gallery, Annex Central 1st floor

7:30–8:15 am **Speaker’s Breakfast**

Casella Gallery, Annex Central

(This event is for program presenters only.)

8:15–8:20 am **Welcome**

Blount Auditorium, Annex Central Building 106

Zorica Pantić

President, Wentworth Institute of Technology

8:20–8:30 am **Opening Remarks**

Blount Auditorium, Annex Central Building 106

Erin Walcek Averett (Creighton University), Derek

B. Counts (University of Wisconsin-Milwaukee)

and Jody Gordon (Wentworth Instit. of Tech.)

8:30–10:45 am **Session II: Mobile Computing in the Field**

Blount Auditorium, Annex Central Building 106

Moderator: Steven Ellis (University of Cincinnati)

Agenda: This session allows participants to present experiments (both successful and unsuccessful) and best practices currently being developed by various projects using mobile computing in the field. The goal is to highlight the diverse ways mobile devices are being used and explore the range of factors that impact different types of projects utilizing these tools. After the presentations, the moderator will lead a short discussion aimed at elucidating key issues in mobile data collection and analysis so that these issues can be revisited during the later Round Table Session.

“Pompeii and the iPad: New Practices, New Philosophies”

8:30–8:55

Steven Ellis (University of Cincinnati)

“Digital Pompeii: Dissolving the Fieldwork-Library Research Divide”

8:55–9:20

Eric Poehler (University of Massachusetts-Amherst)

“Integrating Digital and Physical Workflows in Archaeological Fieldwork: Lessons from Three Paperless Projects”

9:20–9:45

Chris Motz (University of Cincinnati)

“Digital Archaeology in the Rural Andes: Problems and Prospects”

9:45–10:10

Matthew Sayre (University of South Dakota)

“Postcards from the Pladypos: Field-Testing the First Generation of Cognitive Robots for Underwater Archaeology”

10:10–10:35

Bridget Buxton (University of Rhode Island) and Nikola Miskovic (University of Zagreb)

Moderated Discussion

10:45–11:00 am **Coffee Break**

Casella Gallery, Annex Central

(Open to all registered attendees.)

11:00 am–1:00 pm **Session III: Systems for Archaeological Data Management**

Blount Auditorium, Annex Central Building 106

Moderator: Shawn Ross (FAIMS Project,

Macquarie University, Australia)

Agenda: This session focuses on archaeological information systems and how these integrated digital workflows manipulate archaeological data from the field to the repository. The presentations provide an overview of existing systems and demonstrate their key features to provide insights into different approaches to system design, data collection, processing and analysis, as well as issues of interoperability. The goal is to initiate a dialogue between systems developers and users to shed light on current problems and future prospects for systems' design.

“Cástulo: a Test Site for a New Digital Information System”

11:00–11:25

Marcelo Castro (Regional Government of Culture and Sport, Junta de Andalucía, Jaén, Spain), Francisco Arias (Archaeological Ensemble of Cástulo, Linares, Spain), María Libertad Serrano, Ana Martínez Carrillo, Manolo Serrano Araque (Forum MMX Project, Linares, Spain)

“CSS for Success? Exploring Browser-Based Data Collection Using Tablets and the Archaeological Recording Kit (ARK)”

11:25–11:50

Andrew Dufton (Brown University)

“Digital Archaeology in the Private Sector: Leveraging Technology in Cultural Resource Management”

11:50–12:15

Ted Roberts and Shawn Fehrenbach (PaleoWest Archaeology)

“Creating Interoperable Digital Datasets: the Federated Archaeological Information Management Systems (FAIMS) Project”

12:15–12:40

Shawn Ross (FAIMS Project, Macquarie University, Australia)

Moderated Discussion

1:00–2:00 pm

Speakers' Lunch & Discussion

Beatty Cafeteria, Beatty Hall 1st floor

(This event is for program presenters only.)

2:15–4:45 pm

Session IV: Pedagogy, Data Curation, and Reflection

Blount Auditorium, Annex Central Building 106

Moderator: Eric Kansa (UC-Berkeley)

Agenda: Archaeology continues to be revolutionized through the integration of new digital technologies into its methods and processes. Historically, technology has greatly enhanced archaeologists' ability to understand the past, yet technology also alters the ways that archaeologists approach their data in relation to pedagogy, analysis, and long-term preservation. This session's goal is to reflect on the ways that mobile computing and open access data management are changing how archaeologists develop and teach field methods, as well as how they interact with objects and sites as new datasets are born and old ones are revisited in increasingly rapid and multifaceted ways.

“Teaching Archaeology with a Digital Data Collection Protocol”

2:15–2:40

Rebecca Bria (Vanderbilt University)

“Technology and Teaching at the Athienou Archaeological Project, Cyprus”

2:40–3:05

Jody Gordon (Wentworth Institute of Technology), Kyo Koo (Davidson College), Michael K. Toumazou (Davidson College), Derek B. Counts (University of Wisconsin-Milwaukee), Erin Walcek Averett (Creighton University)

“Teaching Practice While Developing Practice: Mobile Computing at the Gabii Project Field School”

3:05–3:30

Rachel Opitz (University of Arkansas)

“From the Web to the Field: Using Online Data Collections in Field Research”

3:30–3:55

Eric Kansa (UC-Berkeley)

“On Screen Triples: Linked Open Data and Born Digital Archaeological Data”

3:55–4:20

Sebastian Heath (Institute for the Study of the Ancient World, New York University)

“Toward a Slow Archaeology”

4:20–4:45

Bill Caraher (University of North Dakota)

4:45–5:00 pm

Coffee Break

Casella Gallery, Annex Central

(Open to all registered attendees.)

5:00–6:00 pm

Round Table Session: The Potential of Mobile Computing, the Future of Digital Archaeology, & Broader Implications *Blount Auditorium, Annex Central Building 106*

Moderators: Derek B. Counts (University of Wisconsin-Milwaukee) and Sebastian Heath (Institute for the Study of the Ancient World, New York University)

Topic 1: Mobile computing in the field: past experiences and future directions.

Topic 2: Making digital archaeology the norm – how do we accomplish parity in the use of digital technologies among projects of different scope and funding? What online presence can be created to help start-up projects and/or projects lacking technical support achieve this?

Topic 3: App accessibility? Off-the-shelf or build your own? Should all projects have an integrated FAIMS-type system workflow?

Topic 4: What is the broader significance of digital archaeology and mobile computing for the humanities? How do these types of changes in the way we “do” humanities affect how we cognitively craft our research processes and how we interpret our evidence? How does this enhance dissemination of information and visitor experience and create a dynamic educational environment?

Topic 5: Brainstorming a ‘manifesto’ for mobile computing in archaeology. What would such a manifesto look like ideally? Should it be inclusive, reflexive?

6:00–7:00 pm

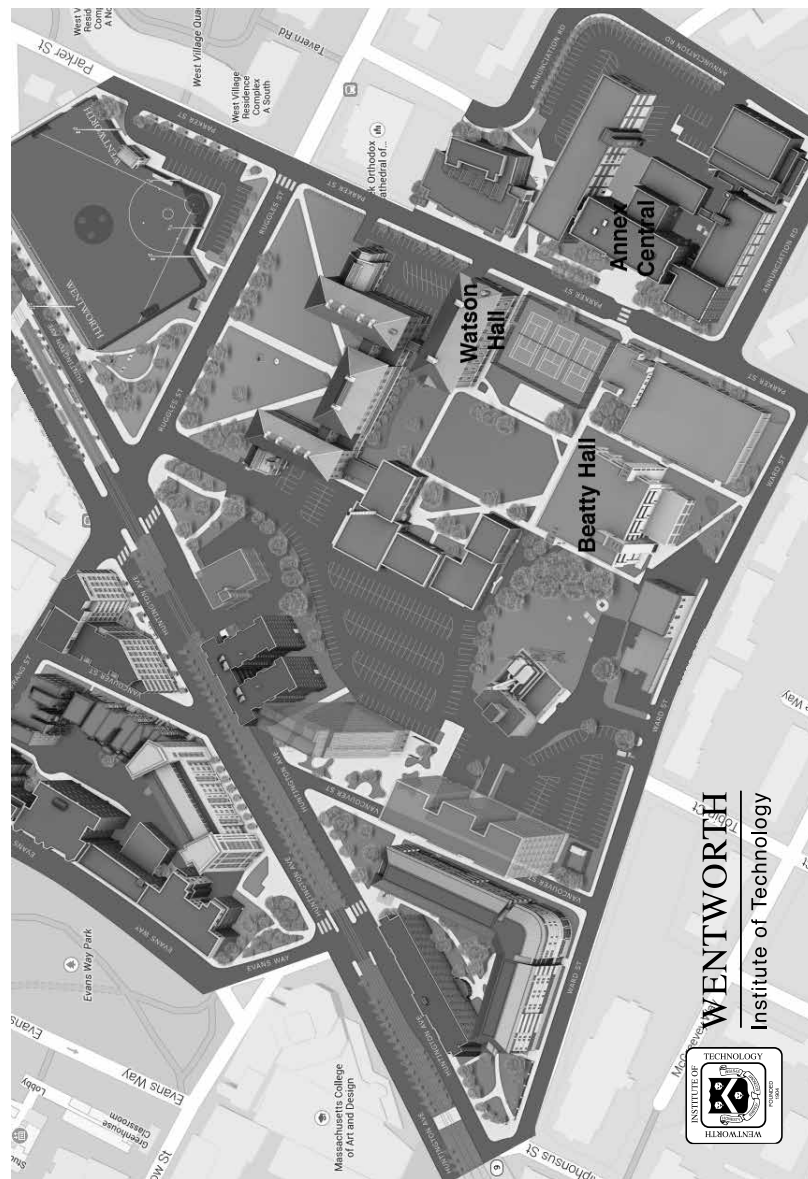
Plenary Lecture: “The Ara Pacis and Montecitorio Obelisk of Augustus: a Simprical Investigation”

Bernard Frischer (Indiana University)
Blount Auditorium, Annex Central Building 106

8:00–10:30 pm

Speakers’ Dinner & Discussion

*Doyle’s Café
3484 Washington St.
Boston, MA 02130
(This event is for program presenters only.)*



Presentation Abstracts

ASHLEY, Michael (Center for Digital Archaeology – UC Berkeley)
“Mukurtu CMS: Differential Access for the Ethical Stewardship of Cultural and Digital Heritage”

Archaeological research projects rarely occur in vacuums, but are situated in often-complex circles of interested parties - the stewards and stakeholders who may have rightful claims to the archaeological places and to the archaeological knowledge being withdrawn from them. As archaeologists, we are afforded a powerful position of deciding what is knowledge, what is data, who gets access, under what circumstances, if at all.

In this discussion, we will look at where we're failing and succeeding to connect with stakeholder priorities for differential access to cultural content, and what this means for all of us in developing informed exchanges for digital archaeology. We'll explore Mukurtu CMS, a free and open source platform designed specifically to address some of these challenges and how community based agile software development can help to humanize our discipline.

Mukurtu CMS has been built in collaboration with indigenous communities worldwide, and addresses the need for differential access to knowledge based on cultural protocols that are in practice within and around communities, and that define interactions with the public, researchers, governmental organizations, and archaeologists. Mukurtu CMS is both an ethos and real software, designed to promote ethical exchange from planning to publishing. We will discuss the roadmap and demonstrate the applications, released and forecast, including Mukurtu CMS, Mobile, Exhibit, and Mukurtu.net, and how they can be weaved into any archaeological endeavor.

BRIA, Rebecca (Vanderbilt University)
“Teaching Archaeology with a Digital Data Collection Protocol”

In 2011, the Proyecto de Investigación Arqueológico Regional Ancash (PIARA, Peru) inaugurated an archaeological field school that employed a comprehensive digital data collection protocol for field and laboratory archaeological research. We taught students how to record and organize archaeological data on computer tablets using our custom relational databases for excavation, human skeletal recovery and analysis, and artifact classification. The databases integrated digital media, such as vector drawings, annotated photos, and Harris matrices. We also instructed

students to digitally map features and artifacts, lay out an excavation grid with a total station, and georectify then draw plan maps using GIS. The students used the computer tablets to visualize relationships between the data, analyze the excavation contexts, and make preliminary interpretations.

This paper reviews the benefits and challenges of using a 100% digital data collection protocol to teach archaeological methods to students. It discusses how digital data collection and analysis can enhance student understanding of archaeological field and laboratory analysis, especially when paired with training in traditional pencil and paper data collection techniques. Through an analysis of three years of our field school training, the paper argues that digital technology is not simply a means of more efficient data collection. Rather our digital database develops more perceptive archaeologists who can immediately recognize and interpret different possible relationships between archaeological materials, contexts, and features. The technology, then, not only aids in-field planning and interpretation, but also cultivates critical thinking skills.

BUXTON, Bridget (University of Rhode Island) and Nikola MISCOVIC (University of Zagreb)

“Postcards from the Pladypos: Field-testing the First Generation of Cognitive Robots for Underwater Archaeology”

Since the early years of the modern discipline, nothing in underwater archaeology has evolved as dramatically as the technology for site and landscape recording. Photogrammetry, Photo-modeling, SLAM, and various acoustic imaging systems have all been touted as the 'next big thing' in digital mapping. Yet as much as archaeologists are eager to trade the laborious work of manual recording for the promises of the latest gadgets, we have yet to find a site-mapping technology with enough clear advantages for it to be widely adopted. Issues of cost, accuracy, and post-processing time are usually paramount. The capability to translate points and images into archaeologically useful data and diagrams is also a concern. In this paper I discuss the experience of using the Pladypos cognitive diving robot built by the University of Zagreb to map the ancient port of Caesarea, and offer some ideas about the future of robotics in underwater archaeology.

CARAHER, William (University of North Dakota)
“Toward a Slow Archaeology”

Over the past century, technology has influenced archaeology in myriad ways. From photography, the introduction of personal computers, to the

use of 3D scanners, tablet computers, and open access online datasets, archaeology has long embraced the latest technologies to document artifacts and contexts in increasingly detailed ways. Technology has had a particularly significant impact on field practices by shaping archaeological workflow and the social organization of archaeological projects. This has brought with it some obvious rewards in terms of efficiency, detail, and consistency of archaeological recording.

In recent decades these changes have accelerated with rapid changes in technology, and many archaeologists find themselves spending as much time looking at a computer screen as a trench or survey unit. The interplay of technology and archaeological methods have slowly changed how we work in the field. Complex tasks have increasingly been fragmented to produce data friendly bits of information that become the basis for archaeological analyses conducted in a computer lab or a faculty office. The archaeologist has increasingly seen the field as the place for efficient data collection and analysis as something that occurs later. This paper introduces the idea of “slow archaeology” as a way to prompt some critical reflection on this way that technology has impacted the production of archaeological knowledge, the structure of fieldwork, and, ultimately, the nature of the discipline.

CASTRO, Marcelo (Regional Government of Culture and Sport, Junta de Andalucía, Jaén, Spain), Francisco ARIAS (Archaeological Ensemble of Cástulo, Linares, Spain), María Libertad SERRANO (Forvm MMX Project, Linares, Spain), Manolo Serrano ARAQUE (Forvm MMX Project), Ana Martínez CARRILLO (Forvm MMX Project)
“Cástulo: a Test Site for a New Digital Information System”

The site of Cástulo is located near Linares in the province of Jaén, Andalusia, Spain. The site was continuously occupied from prehistory to the sixteenth century CE. Following the short slumber of a few centuries, Cástulo has resurfaced as a new model of community work. Cástulo’s Project Forvm MMX has developed a new system of archaeological documentation, provisionally called TooWaste. The system was created with several concepts in mind: the immediate transmission of archaeological data from the site to database and the creation (and optimization) of a standard work-method for both the site and the laboratory in the museum. The system was designed to allow the simultaneous work of several teams (excavators, supervisors, conservators, and researchers).

The tools used are simple: paper forms with a pattern of micro-dots; a microscanner in a digital pen that allows the device to recognize the field being completed in the database; a smartphone connected to the pen

via Bluetooth to receive data; and our server/database, connected via a data connection to the smartphone. There are five different forms for excavators to use depending on the type of information to be recorded: spatial data, drawings, descriptions of stratigraphy, and the inventory of materials found. We are also able to include three-dimensional models in TooWaste using a GIS. These models can be used by researchers to visualize the data collected during excavation. TooWaste also generates a unique QR code for every single artifact in the database, allowing for instant identification of any object and its relationship to the site.

DUFTON, Andrew (Brown University)
“CSS for success? Exploring Browser-based Data Collection Using Tablets and the Archaeological Recording Kit (ARK)”

The Archaeological Recording Kit (ARK) is an Open Source system for flexible, web-based archaeological data management. Designed to facilitate simultaneous data creation and dissemination through a simple web interface, ARK faces new challenges with the growing use of tablets for on-site recording. How do mobile systems interact with ARK’s single-server functionality? Should the ARK team develop a stand-alone tablet application?

This paper looks at a range of projects exploring mobile data collection using the ARK system. The scope of these projects ranges from a traditional research-driven excavation at Hadrian’s Villa at Tivoli, to a crowd-funded community project in the British countryside, to commercially-driven rescue work in the heart of London, to a methods class taught on the Brown University campus. A discussion of the potentials and pitfalls of various integration techniques used in these case studies will provide insights on the most fruitful future directions for the ARK platform, and on the benefits of browser based data collection more generally for a paperless archaeological practice.

ELLIS, Steven (University of Cincinnati)
“Pompeii and the iPad: New Practices, New Philosophies”

This paper reviews the *longue durée* (of some four years or so) of using the iPad to record the excavations of one of the Mediterranean’s largest and most complex urban sites. In that time a striking number of developments—in software and hardware—have taken place. For a discipline that is so deeply rooted in the ‘traditional’ way of doing things, it is not just the new form of paperless recording that can register deep shockwaves to the archaeological recording system, but the very concept itself of rapid and ongoing changes in those paperless methodologies.

So beyond tracking some of these developments and their proven and potential contributions, this paper is interested in the disciplinary-wide reception of paperless recording methods. This review thus turns its attention to the philosophies of digital recording methods and takes a critical approach to both traditional and paperless recording practices for (especially) large urban sites with very variable datasets.

FEE, Sam (Washington and Jefferson College)

“If I Knew Then What I Know Now: Reflections on Custom Mobile App Development”

With the widespread adoption of tablet computers in 2010, archaeologists quickly began to envision new ways of completing old tasks. The technology seemed particularly well suited for replacing our old paper-and-pencil approach to data collection. So, in 2011 we began writing a custom application - PKapp - for the 2012 field season of the Pyla-Koutsopetria Archaeological Project on Cyprus. That application taught us how to write software for mobile devices, while also illuminating numerous possibilities for digital workflow in archaeological field research.

In the subsequent years, mobile computing devices and software development tools have improved considerably, making them even more useful for custom application development and data collection in the field. Further, HTML5 open source standards can ensure the software runs on any device regardless of operating system platform. Even better, a robust selection of coding interfaces, libraries, and frameworks can speed up the development process and allow us to get away from hand-coding each line of our applications (as might have been the case just a few short years ago). Thus in many ways, it is easier and faster to write your own custom data collection mobile app today than it was in 2011. This paper reflects upon our earlier work with PKapp, reflects upon the lessons learned, and describes how custom app development with open source standards might be undertaken today.

FRISCHER, Bernard (School of Informatics, Indiana University)

“The Ara Pacis and Montecitorio Obelisk of Augustus: A Sempirical Investigation”

This talk first reports on research undertaken to determine the validity of Edmund Buchner’s theory that the Montecitorio obelisk was aligned to the Ara Pacis such that during the day of Augustus’ birthday (September 23, according to Buchner) the shadow of the obelisk proceeded down the equinoctial line of a hypothesized horizontal sundial inscribed on a

monumental pavement to or toward the center of the Ara Pacis. The research project developed and utilized: two new, independent surveys of the meridian fragment discovered by Buchner under the building at Via di Campo Marzio 48; the newly-available Edmund Buchner Archive housed at the AEK, Munich; and an interactive computer simulation of this area of the ancient city as well as the apparent path of the sun in the sky during the period 9 BC to 40 AD. The major conclusions reached by the research project are that: (1) Buchner was correct to postulate a solar alignment between the Ara Pacis and the obelisk; (2) Buchner’s positioning of the meridian and obelisk should be corrected; and (3) once these corrections are made, Buchner’s theory is not confirmed. Finally, (4) the computer simulation suggests that an alternative theory may better account for the alignment, viz., that the point was to stand on axis with the east entrance of the Ara Pacis on the Via Flaminia and see the sun’s disk seemingly centered on the top of the pyramidion of the obelisk during the afternoon of October 9. That date is significant: it is the festival day of Apollo Palatinus, a god with whom Augustus had a particularly close relationship. I conclude with some general remarks about empiricism: a new methodology made possible by interactive simulations of historical monuments and sites. Empiricism holds great promise for the disciplines of archaeology as well as architectural, art, and cultural history.

GORDON, Jody (Wentworth Institute of Technology), Kyo KOO (Davidson College), Derek COUNTS (University of Wisconsin-Milwaukee), Erin Walcek AVERETT (Creighton University), Michael TOUMAZOU (Davidson College)

“Technology and Teaching at the Athienou Archaeological Project, Cyprus”

For the last 25 years, the Athienou Archaeological Project (AAP) has conducted pedestrian survey and excavations of domestic, religious, and funerary sites in the Malloura Valley on the island of Cyprus. From its inception, the project has made the training of undergraduate students a key element of its archaeological process and method. AAP thus enhances our understanding of inland Cyprus, while at the same time training a new generation of archaeologists. To enhance excavation, interpretation, and the field school, the project has recognized the utility of integrating emergent technologies into the excavation process and has acknowledged the importance of acquainting students with such technologies. Indeed, since 1990, AAP has participated in the transition from handwritten notebooks to born-digital, tablet-based recording. Therefore, AAP offers a unique perspective from which to observe the digital age’s influence on archaeology. Drawing on this experience, in 2011 AAP proved to be one of the first projects to embrace the “paperless” archaeology revolution that is quickly becoming standard in field archaeology.

This paper describes AAP's transition to a born-digital, tablet-based, archaeological recording system and web-based, PHP-coded database, and how this experiment has influenced its data recording, site interpretation, and pedagogical methods. We discuss the benefits and drawbacks of system implementation, and demonstrate how born-digital data recording has provided immediate logistical and academic benefits that have positively influenced both research and teaching. Overall, by sharing our experience, we hope to engender comparisons with other projects implementing born-digital recording protocols and to contribute to best practices within the discourse of digital archaeology.

HEATH, Sebastian (Institute for the Study of the Ancient World, New York University)

“On Screen Triples: Linked Open Data and Born Digital Archaeological Data”

This paper explores the utility of Linked Open Data (LOD) as framing metaphor when considering the role of tablet computing in archaeological workflows. In doing so it will particularly look for overlap between the rhetoric of materiality that exists both within the interfaces of touch-screen devices and within the terminology of LOD. For its part, LOD encourages the use of “things, not strings.” For example, the physical place identified by the English string of characters “Rome” as meaning the capital of the ancient empire becomes a more flexible and reusable entity within a dataset when its Pleiades identifier “<http://pleiades.stoa.org/places/423025>” is used instead. Tablets are a natural environment for moving the metaphor of web address as “thing” into the realm of actual user experience (UX). Tablets already allow direct manipulation of on-screen controls to support such actions as scrolling through lists of information. This paper asks if that idea can be pushed forward to manipulation of flexible data types and the links between them.

KANSA, Eric C. (University of California-Berkeley)

“From the Web to the Field: Using Online Data Collections in Field Research”

Digital data, if considered at all, hovers at the margins of intellectual interest in archaeology. Data carry mainly operational and bureaucratic concerns, to be “managed” (in the parlance of the NSF) and maybe archived. In this light, NSF data management plan requirements, which hardly ever see meaningful peer-review, reinforce the notion that data have more to do with administrative compliance and little to do with the intellectual core of research. Thus, discussions about data heavily focus issues of standards, metrics, interoperability, “best practices,” and re-

quired investments in cyberinfrastructure.

As the adage goes: “Garbage in, Garbage out.” Bureaucratically mandated data archiving may fill our repositories, but is our discipline filling our repositories with anything useful? Recent studies of data curation practices highlight the challenges of data reuse. To better realize the full potential of using data, archaeology needs to see fundamental changes in research practices and professional roles, expectations, and inclinations. Open Context's experiments with data sharing as a form of publishing help highlight needs for a host of new skills and professional roles. Moreover these experiments show how access to data created by our peers, together with open communication and collaboration at each stage of the research processes, can enhance the quality and research value of data. Without more experimentation and thought in how we situate archaeological data in the creation and transmission of archaeological knowledge, we will merely optimize the status quo, and do little to open new horizons for understanding the past.

MOTZ, Chris (University of Cincinnati)

“Integrating Digital and Physical Workflows in Archaeological Fieldwork: Lessons from Three Paperless Projects”

This paper draws on the author's four years of experience developing and/or managing paperless recording systems for three archaeological projects: the Sangro Valley Project (Abruzzo, Italy), the Pompeii Archaeological Research Project: Porta Stabia (Pompeii, Italy), and the Say Kah Archaeological Project (Say Kah, Belize).

Since 2011 the Sangro Valley Project (SVP) has employed a custom-built paperless recording system with iPads and FileMaker at its core. This paper summarizes the evolution of the SVP's paperless system and will present some lessons learned during the SVP's four seasons of paperless recording as well as the author's work with other projects. It identifies some of the most common problems that are encountered during the implementation of paperless recording systems and finally offers recommendations for avoiding or fixing them. Many of these problems are not unique to projects with digital recording systems, and most of the difficulties were not technical in nature. Rather, many of the most significant problems arose from integrating workflows. This includes not only digital and physical workflows, but also the workflows of different actors in the project. Digital recording systems can streamline fieldwork, improve the quality of data collected in the field, and significantly reduce errors and misunderstandings, but they require careful and thoughtful preparation and implementation.

OLSON, Brandon R. (Boston University) & Manny MOSS (City University of New York)

“Digital Imaging and Spatial Analysis in Archaeology: Problems and Prospects”

Archaeology is an inherently destructive discipline whose practitioners are obliged to document their effects upon the material record in a meaningful way. While documentation methods have taken many forms, most are two-dimensional representations of a three-dimensional (3D) phenomenon. Advances in 3D technology, however, now make it possible to quickly generate accurate, photorealistic 3D models of any object of interest using a series of digital still photographs. Using various algorithms, a handful of commercially available software packages offer solutions for high quality 3D documentation applicable to archaeology. This technology, referred to here as image-based modeling, has rapidly proliferated within the discipline, as several projects have implemented 3D documentation techniques for a variety of purposes. With the rapid adoption of a new technology, the early stage of implementation presents certain pitfalls that must be addressed before image-based modeling can become a viable component of an ever-expanding digital archaeological toolkit. Though there are certainly other solutions beyond the scope of our discussion, we seek to present possible solutions to three pitfalls that image-based modeling practitioners will (or are) currently facing: curation (how does one responsibly organize and store 3D models and their associated files?), dissemination (how can these data be made useful to other team members during a field season?), and interpretation (how can these data be maximally utilized to address both real-world and theoretical/conceptual archaeological problems?).

OPITZ, Rachel (University of Arkansas)

“Teaching Practice while Developing Practice: Mobile Computing at the Gabii Project Field School”

Mobile tablets are increasingly commonplace on excavations, and (optimistically) rapidly on pace to be pervasive. They open a world of possibilities for collecting and sharing better information in better ways. Taking advantage of the possibilities afforded by the new tools that continue to appear on the market (3D on mobile! Real time sync! IR photography!) is what gets many of us excited and we want to make the most of what mobile tablets have to offer. Trying out new recording strategies and techniques and continually improving our digital field practice are essential to bringing mobile digital technologies onto excavations. For projects run as field schools, where students are actively engaged in the recording process, this poses certain challenges. We’re trying to teach

students what to do in the field, and how the documentation system works, and why we record what we record, often while learning ourselves or changing our strategies. For someone trying to take on the deluge of practical information (e.g. how to trowel, the difference between ceramic and tufa, what “compactness” and “sorting” mean) the deluge of excavation minutiae (something as small as re-ordering the boxes on the digital context sheet) can introduce significant confusion. Add to this a variety of different learning styles, levels of experience, and inherent levels of comfort with technology that are inevitable within a large group and a real challenge emerges. How can we best push forward, implementing new technologies and methods, and continually challenging ourselves while providing a valuable learning experience for students?

POEHLER, Eric (University of Massachusetts-Amherst)

“Digital Pompeii: Dissolving the Fieldwork-Library Research Divide”

Critical reading of stratigraphy and bibliography are, though obviously different skills, equally critical to archaeological inquiry. These intellectual acts are separated not only by the different cognitive functions they engage (spatial vs. narrative) but also by the time and distance between the trench and the library. In the 21st century, the advent of new and diverse forms of digital archaeological practice is revolutionizing the ways in which archaeologists work in the field. We have already witnessed the first part of the revolution: the transformation of archaeological methods of data collection and, to a lesser extent, how such data are accessed and deployed in the field. A second facet of the digital revolution is just beginning: the growing availability of published scholarship in digital form, downloaded to the trench edge. It seems inevitable that secondary sources soon will be as easy to implement in the field as the trowel, effectively (if theoretically) dissolving the spatio-temporal division between fieldwork and library work. In this paper, I wish to describe two examples of this dissolution of the fieldwork-library divide: one archival in nature (the online platform, DM, used by the Pompeii Quadriporticus Project), the other bibliographic (the Pompeii Bibliography and Mapping Project). The brief discussion of each platform’s operation is intended to set the stage for a more speculative foray into how such digital practices will transform archaeological practice in the coming decade, its advantages and pitfalls. What will it mean to choose from among so many possible aspects of research: digging (data collection), primary (stratigraphic) and secondary (bibliographic) analysis, interpretation (phasing and contextualization) and narrative synthesis (writing)?

ROBERTS, Ted and Shawn FEHRENBACH (PaleoWest Archaeology)

“Digital Archaeology in the Private Sector: Leveraging Technology in Cultural Resource Management”

PaleoWest Archaeology has developed an innovative approach to archaeological projects, employing a fully digital workflow for data collection and management. Our purpose is to improve the quality of data collected in the field while simultaneously making the process more efficient, allowing us to deliver a higher quality product to our clients at a better value. Our approach employs a customized database system and carefully selected suite of applications that are leveraged from smartphones and tablets, as well as traditional computers. Field tasks that once required point-and-shoot cameras, graph paper and rulers, stand-alone handheld GPS units, and a litany of paper forms are accomplished by PaleoWest teams armed with fully customized iPads and iPhones. Data from photos to forms to locations are managed in a central database, where PaleoWest staff in the field and office can work together on the data using applications with simple and intuitive user interfaces. Data are easily exported into reporting documents for final delivery to our clients. The system thus eliminates digitization after fieldwork, eliminates redundancies in data entry, reduces error in data entry, improves data security via networking, and allows concurrent reporting as office staff work with data in real time from the field. The research and development began in 2009 and was completed in early 2013, though emerging technologies and new ideas and problems continue to shape and inform this system.

ROSS, Shawn (FAIMS Project, Macquarie University, Sydney, Australia)

“Creating Interoperable Digital Datasets: the Federated Archaeological Information Management Systems (FAIMS) Project”

The Federated Archaeological Information Management Systems (FAIMS) project has developed a community-driven, open-source platform for mobile recording of field and laboratory data. Responding to the initial requirements voiced by archaeologists, the FAIMS mobile platform (an Android application supported by an Ubuntu server) integrates the capture of structured, narrative, geospatial, and multimedia data, while automating processes such as data synchronization, backup, and version control across multiple devices. The entire system also works offline. Recognizing the diversity of archaeological practice, FAIMS incorporates customizable data structures, interface behavior, and export formats. At the same time, archaeological research benefits from the production and dissemination of reusable and re-purposable datasets. To accommodate both flexibility and interoperability, FAIMS software

provides tools to map data to shared vocabularies as it is created. Using an approach borrowed from IT localization, interface text, including the names of entities (e.g., ‘stratigraphic unit’), attributes (e.g., ‘soil color’), and controlled-vocabulary values (‘Munsell 5YR’), can be saved and exported using widely-shared terminology (including uniquely identified terms in an ontology) but displayed using the preferred language of an individual project (e.g., ‘stratigraphic unit’ can display as ‘context’). Second, open-linked data URIs can be embedded in all entities, attributes, and controlled-vocabulary values (linking, e.g., species to the Encyclopedia of Life, or places to Pleiades). Finally, data can be systematically transformed or amplified during export, a final opportunity for mapping to shared ontologies or linking to URIs. These approaches balance the flexibility required by archaeologists with the ability to produce interoperable data.

SAYRE, Matthew (University of South Dakota)

“Digital Archaeology in the Rural Andes: Problems and Prospects”

The Stanford Archaeological Project at the UNESCO World Heritage site of Chavin de Huantar, Peru, has had a long and fruitful engagement with mobile technologies. We were early adapters in the use of photogrammetry, standardized use of theodolites, laser scanner mapping, and the use of aerial photography in site mapping. Here I consider the use and role of the Reveal Program in digital archaeology. Much of the program seems to have been designed with Mediterranean Archaeology in mind and our project encountered certain limitations with the program while attempting to employ it in a rural Andean setting. The lack of access to reliable internet and the limited ability to repair damaged goods negatively impacted our experience with this technology. Additionally, issues arose in using digital mobile technologies at a temple site with great time depth and incredible stratigraphic variation partially derived from ancient large-scale movement of earth. Our project is moving ahead with mobile computing and is interested in benefiting from the best practices shared at this conference as well enhancing future collaborations with similarly engaged researchers.

WALLRODT, John (University of Cincinnati)

“Why Paperless?: Digital Technology and Archaeology”

This presentation explores the impact of digital recording technologies in archaeology, both in excavation and survey. Although archaeologists have embraced the latest technologies in photography, geophysics, material sciences, and environmental studies, we have been slow to adopt new recording devices and methods for primary field data collection.

Despite the huge cultural shift to paperless technologies and its incorporation into many disciplines, most archaeological projects continue to rely on paper forms and hand written notebooks.

Using the examples of PARPS (Pompeii Archeological Research Project: Porta Stabia), a three-year excavation, and KARS (Kea Regional Archaeological Project), a three-year regional survey, I highlight the benefits of paperless projects and discuss some of the pitfalls. The obvious shortcomings are the initial cost of the equipment and training. In both projects, however, the benefits far outweigh the shortcomings. Digital recording allows us to increase the accuracy of the data, enabling immediate cross-referencing, and to circulate the data promptly, which improves the information flow for the project. These developments limit errors and provide the opportunity to repair any extant errors directly.

Digital recording on these projects have also exposed weakness in the management structure of archaeological projects, especially in excavation, and afford us the opportunity to develop new approaches. In excavation, for example, most of the recording in the trench is still directed by a single trench supervisor. This management model dates to the origins of stratigraphic excavations and does not leverage the potential strengths of the other excavators in the trench. The shift from paper to paperless recording on tablets easily facilitates multivocality in the recording, which can greatly increase the quantity and quality of trench level observations. The continued adherence to the top-down management culture of excavation leads to observer bias and data gaps and thereby ignores the full potential of this new technology.

WERNKE, Steven A. (Vanderbilt University), Julie A. ADAMS (Vanderbilt University), Eli HOOTEN (Vanderbilt University), Gabriela ORE (Vanderbilt University), Carla HERNANDEZ (Vanderbilt University), Aurelio RODRIGUEZ (Independent Scholar), and Giancarlo MARCONE (Proyecto Qhapaq Ñan, Ministry of Culture of Peru)

“Beyond the Basemap: Site and Landscape Survey through Low Altitude Aerial Photogrammetry and Mobile GIS in the Andes”

With the rapid development of UAVs (“drones”), photogrammetry, and mobile GIS, archaeology is at the cusp of major transformations in the basic methodologies for recording spatial and observational data at virtually all scales of analysis. We present a system for rapid low-altitude aerial survey and feature documentation using UAVs and lighter than air platforms, coupled with mobile GIS for intensive site survey. Starting at sea level and stepping up the vertical landscape of the Andes, we document sections of a major transverse Inka highway between the coast and

highlands, documenting the road, its surrounding cultural landscape, and imperial logistical nodes. The data collection and processing production chain used to produce raster- and vector-based representations of archaeological settlements, features, and landscapes is presented. We document features made of wattle and daub (coast), adobe (coast and mid-elevation), and stone (highlands) in distinct terrain and ecological contexts. Subjects of analysis include imperial installations, settlements, and sections of the royal Inka highway and its environs. We discuss appropriate UAV designs and specifications for different environmental contexts and archaeological subjects. Secondly, we present a paperless, mobile GIS system for attribute registry, including architectural survey, intensive surface collections, and lichenometric dating. Together, high-resolution photogrammetry and mobile GIS provide richer, faster, and more cost effective data registry than traditional methods. We envision a near future in which UAVs and other low altitude platforms will become a commonplace means of extending the observational capabilities of research archaeologists and caretakers of archaeological patrimony.

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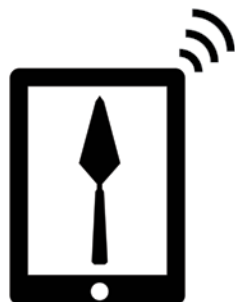
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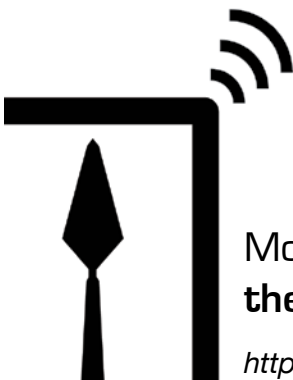


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Mobilizing the Past for a Digital Future:
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