MOBILIZING *the* PAST *for a* DIGITAL FUTURE

The Potential of Digital Archaeology

Edited by
Erin Walcek Averett
Jody Michael Gordon
Derek B. Counts

Mobilizing the Past for a Digital Future

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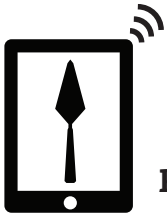

Preface & Acknowledgments

This volume stems from the workshop, "Mobilizing the Past for a Digital Future: the Future of Digital Archaeology," funded by a National Endowment for the Humanities Digital Humanities Start-Up grant (#HD-51851-14), which took place 27-28 February 2015 at Wentworth Institute of Technology in Boston (http://uwm.edu/mobilizing-the-past/). The workshop, organized by this volume's editors, was largely spurred by our own attempts with developing a digital archaeological workflow using mobile tablet computers on the Athienou Archaeological Project (http://aap.toumazou.org; Gordon *et al.*, Ch. 1.4) and our concern for what the future of a mobile and digital archaeology might be. Our initial experiments were exciting, challenging, and rewarding; yet, we were also frustrated by the lack of intra-disciplinary discourse between projects utilizing digital approaches to facilitate archaeological data recording and processing.

Based on our experiences, we decided to initiate a dialogue that could inform our own work and be of use to other projects struggling with similar challenges. Hence, the "Mobilizing the Past" workshop concept was born and a range of digital archaeologists, working in private and academic settings in both Old World and New World archaeology, were invited to participate. In addition, a livestream of the workshop allowed the active participation on Twitter from over 21 countires, including 31 US states (@MobileArc15, #MobileArc).[1]

[1] For commentary produced by the social media followers for this event, see: https://twitter.com/electricarchaeo/status/571866193667047424, http://shawngraham.github.io/exercise/mobilearcday1wordcloud.html, https://twitter.com/electricarchaeo/status/571867092091338752, http://www.diachronicdesign.com/blog/2015/02/28/15-mobilizing-the-past-for-the-digital-future-conference-day-1-roundup/.

Although the workshop was initially aimed at processes of archaeological data recording in the field, it soon became clear that these practices were entangled with larger digital archaeological systems and even socio-economic and ethical concerns. Thus, the final workshop's discursive purview expanded beyond the use of mobile devices in the field to embrace a range of issues currently affecting digital archaeology, which we define as the use of computerized, and especially internet-compatible and portable, tools and systems aimed at facilitating the documentation and interpretation of material culture as well as its publication and dissemination. In total, the workshop included 21 presentations organized into five sessions (see program, http://mobilizingthepast.mukurtu.net/digital-heritage/mobilizing-past-conference-program), including a keynote lecture by John Wallrodt on the state of the field, "Why paperless?: Digital Technology and Archaeology," and a plenary lecture by Bernard Frischer, "The Ara Pacis and Montecitorio Obelisk of Augustus: A Simpirical Investigation," which explored how digital data can be transformed into virtual archaeological landscapes.

The session themes were specifically devised to explore how archaeological data was digitally collected, processed, and analyzed as it moved from the trench to the lab to the digital repository. The first session, "App/Database Development and Use for Mobile Computing in Archaeology," included papers primarily focused on software for field recording and spatial visualization. The second session, "Mobile Computing in the Field," assembled a range of presenters whose projects had actively utilized mobile computing devices (such as Apple iPads) for archaeological data recording and was concerned with shedding light on their utility within a range of fieldwork situations. The third session, "Systems for Archaeological Data Management," offered presentations on several types of archaeological workflows that marshal born-digital data from the field to publication, including fully bespoken paperless systems, do-it-yourself ("DIY") paperless systems, and hybrid digital-paper systems. The fourth and final session, "Pedagogy, Data Curation, and Reflection," mainly dealt with teaching digital methodologies and the use of digital repositories and linked open data to enhance field research. This session's final paper, William Caraher's "Toward a Slow Archaeology," however, noted digital archaeology's successes in terms of

time and money saved and the collection of more data, but also called for a more measured consideration of the significant changes that these technologies are having on how archaeologists engage with and interpret archaeological materials.

The workshop's overarching goal was to bring together leading practitioners of digital archaeology in order to discuss the use, creation, and implementation of mobile and digital, or so-called "paperless," archaeological data recording systems. Originally, we hoped to come up with a range of best practices for mobile computing in the field – a manual of sorts – that could be used by newer projects interested in experimenting with digital methods, or even by established projects hoping to revise their digital workflows in order to increase their efficiency or, alternatively, reflect on their utility and ethical implications. Yet, what the workshop ultimately proved is that there are many ways to "do" digital archaeology, and that archaeology as a discipline is engaged in a process of discovering what digital archaeology should (and, perhaps, should not) be as we progress towards a future where all archaeologists, whether they like it or not, must engage with what Steven Ellis has called the "digital filter."

So, (un)fortunately, this volume is not a "how-to" manual. In the end, there seems to be no uniform way to "mobilize the past." Instead, this volume reprises the workshop's presentations—now revised and enriched based on the meeting's debates as well as the editorial and peer review processes—in order to provide archaeologists with an extremely rich, diverse, and reflexive overview of the process of defining what digital archaeology is and what it can and should perhaps be. It also provides two erudite response papers that together form a didactic manifesto aimed at outlining a possible future for digital archaeology that is critical, diverse, data-rich, efficient, open, and most importantly, ethical. If this volume, which we offer both expeditiously and freely, helps make this ethos a reality, we foresee a bright future for mobilizing the past.

* * *

No multifaceted academic endeavor like *Mobilizing the Past* can be realized without the support of a range of institutions and individ-

uals who believe in the organizers' plans and goals. Thus, we would like to thank the following institutions and individuals for their logistical, financial, and academic support in making both the workshop and this volume a reality. First and foremost, we extend our gratitude toward The National Endowment for the Humanities (NEH) for providing us with a Digital Humanities Start-Up Grant (#HD-51851-14), and especially to Jennifer Serventi and Perry Collins for their invaluable assistance through the application process and beyond. Without the financial support from this grant the workshop and this publication would not have been possible. We would also like to thank Susan Alcock (Special Counsel for Institutional Outreach and Engagement, University of Michigan) for supporting our grant application and workshop.

The workshop was graciously hosted by Wentworth Institute of Technology (Boston, MA). For help with hosting we would like to thank in particular Zorica Pantić (President), Russell Pinizzotto (Provost), Charlene Roy (Director of Business Services), Patrick Hafford (Dean, College of Arts and Sciences), Ronald Bernier (Chair, Humanities and Social Sciences), Charles Wiseman (Chair, Computer Science and Networking), Tristan Cary (Manager of User Services, Media Services), and Claudio Santiago (Utility Coordinator, Physical Plant).

Invaluable financial and logistical support was also generously provided by the Department of Fine and Performing Arts and Sponsored Programs Administration at Creighton University (Omaha, NE). In particular, we are grateful to Fred Hanna (Chair, Fine and Performing Arts) and J. Buresh (Program Manager, Fine and Performing Arts), and to Beth Herr (Director, Sponsored Programs Administration) and Barbara Bittner (Senior Communications Management, Sponsored Programs Administration) for assistance managing the NEH grant and more. Additional support was provided by The University of Wisconsin-Milwaukee; in particular, David Clark (Associate Dean, College of Letters and Science), and Kate Negri (Academic Department Assistant, Department of Art History). Further support was provided by Davidson College and, most importantly, we express our gratitude to Michael K. Toumazou (Director, Athienou Archaeological Project) for believing in and supporting our

research and for allowing us to integrate mobile devices and digital workflows in the field.

The workshop itself benefitted from the help of Kathryn Grossman (Massachusetts Institute of Technology) and Tate Paulette (Brown University) for on-site registration and much more. Special thanks goes to Daniel Coslett (University of Washington) for graphic design work for both the workshop materials and this volume. We would also like to thank Scott Moore (Indiana University of Pennsylvania) for managing our workshop social media presence and his support throughout this project from workshop to publication.

This publication was a pleasure to edit, thanks in no small part to Bill Caraher (Director and Publisher, The Digital Press at the University of North Dakota), who provided us with an outstanding collaborative publishing experience. We would also like to thank Jennifer Sacher (Managing Editor, INSTAP Academic Press) for her conscientious copyediting and Brandon Olson for his careful reading of the final proofs. Moreover, we sincerely appreciate the efforts of this volume's anonymous reviewers, who provided detailed, thought-provoking, and timely feedback on the papers; their insights greatly improved this publication. We are also grateful to Michael Ashley and his team at the Center for Digital Archaeology for their help setting up the accompanying Mobilizing the Past Mukurtu site and Kristin M. Woodward of the University of Wisconsin-Milwaukee Libraries for assistance with publishing and archiving this project through UWM Digital Commons. In addition, we are grateful to the volume's two respondents, Morag Kersel (DePaul University) and Adam Rabinowitz (University of Texas at Austin), who generated erudite responses to the chapters in the volume. Last but not least, we owe our gratitude to all of the presenters who attended the workshop in Boston, our audience from the Boston area, and our colleagues on Twitter (and most notably, Shawn Graham of Carlton University for his word clouds) who keenly "tuned in" via the workshop's live-stream. Finally, we extend our warmest thanks to the contributors of this volume for their excellent and timely chapters. This volume, of course, would not have been possible without such excellent papers.

As this list of collaborators demonstrates, the discipline of archaeology and its digital future remains a vital area of interest for people who value the past's ability to inform the present, and who

recognize our ethical responsibility to consider technology's role in contemporary society. For our part, we hope that the experiences and issues presented in this volume help to shape new intra-disciplinary and critical ways of mobilizing the past so that human knowledge can continue to develop ethically at the intersection of archaeology and technology.

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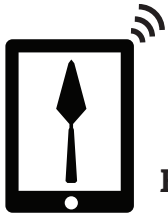
Jody Michael Gordon (Department of Humanities and Social Sciences, Wentworth Institute of Technology)

Derek B. Counts (Department of Art History, University of Wisconsin-Milwaukee)

October 1, 2016



How To Use This Book

The Digital Press at the University of North Dakota is a collaborative press and *Mobilizing the Past for a Digital Future* is an open, collaborative project. The synergistic nature of this project manifests itself in the two links that appear in a box at the end of every chapter.

The first link directs the reader to a site dedicated to the book, which is powered and hosted by the Center for Digital Archaeology's (CoDA) Mukurtu.net. The Murkutu application was designed to help indigenous communities share and manage their cultural heritage, but we have adapted it to share the digital heritage produced at the "Mobilizing the Past" workshop and during the course of making this book. Michael Ashley, the Director of Technology at CoDA, participated in the "Mobilizing the Past" workshop and facilitated our collaboration. The Mukurtu.net site (https://mobilizingthepast.mukurtu.net) has space dedicated to every chapter that includes a PDF of the chapter, a video of the paper presented at the workshop, and any supplemental material supplied by the authors. The QR code in the box directs readers to the same space and is designed to streamline the digital integration of the paper book.

The second link in the box provides open access to the individual chapter archived within University of Wisconsin-Milwaukee's installation of Digital Commons, where the entire volume can also be downloaded. Kristin M. Woodward (UWM Libraries) facilitated the creation of these pages and ensured that the book and individual chapters included proper metadata.

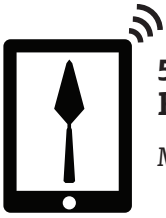
Our hope is that these collaborations, in addition to the open license under which this book is published, expose the book to a wider audience and provide a platform that ensures the continued availability of the digital complements and supplements to the text. Partnerships with CoDA and the University of Wisconsin-Milwaukee reflect the collaborative spirit of The Digital Press, this project, and digital archaeology in general.

Abbreviations

AAI	Alexandria Archive Institute
AAP	Athienou Archaeological Project
ABS	acrylonitrile butadiene styrene (plastic)
ADS	Archaeological Data Service
Alt-Acs	Alternative Academics
API	application programming interface
ARA	archaeological resource assessment
ARC	Australian Research Council
ARIS	adaptive resolution imaging sonar
ASV	autonomous surface vehicle
BLM	Bureau of Land Management
BLOB	Binary Large Object
BOR	Bureau of Reclamation
BYOD	bring your own device
CAD	computer-aided design
CDL	California Digital Library
CHDK	Canon Hack Development Kit
cm	centimeter/s
CMOS	complementary metal-oxide semiconductor
CoDA	Center for Digital Archaeology
COLLADA	COLLAborative Design Activity
CRM	cultural resource management
CSS	Cascading Style Sheet
CSV	comma separated values
DBMS	desktop database management system
DEM	digital elevation model
DINAA	Digital Index of North American Archaeology
DIY	do-it-yourself
DoD	Department of Defense
DVL	doppler velocity log
EAV	entity-attribute-value
EDM	electronic distance measurement
EU	excavation unit/s
FAIMS	Federated Archaeological Information Management System
fMRI	functional magnetic resonance imaging
GIS	geographical information system
GCP	ground control point
GNSS	global navigation satellite system
GPR	ground-penetrating radar

GUI	graphic user interface
ha	hectare/s
hr	hour/s
Hz	Hertz
HDSM	high-density survey and measurement
ICE	Image Composite Editor (Microsoft)
iOS	iPhone operating system
INS	inertial motion sensor
IPinCH	Intellectual Property in Cultural Heritage
IT	information technology
KAP	Kaymakçı Archaeological Project
KARS	Keos Archaeological Regional Survey
km	kilometer/s
LABUST	Laboratory for Underwater Systems and Technologies (University of Zagreb)
LAN	local area network
LIEF	Linkage Infrastructure Equipment and Facilities
LOD	linked open data
LTE	Long-Term Evolution
m	meter/s
masl	meters above sea level
MEMSAP	Malawi Earlier-Middle Stone Age Project
MOA	memoranda of agreement
MOOC	Massive Online Open Course
NGWSP	Navajo-Gallup Water Supply Project
NeCTAR	National eResearch Collaboration Tools and Resources
NEH	National Endowment for the Humanities
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSF	National Science Foundation
OCR	optical character reader
OS	operating system
PA	programmatic agreement
PAP	pole aerial photography
PARP:PS	Pompeii Archaeological Research Project: Porta Stabia
PATA	Proyecto Arqueológico Tuti Antiguo
PBMP	Pompeii Bibliography and Mapping Project
PDA	personal digital assistant

PIARA	Proyecto de Investigación Arqueológico Regional Ancash
PKAP	Pyla-Koutsopetra Archaeological Project
Pladypos	PLAtform for DYnamic POSitioning
PLoS	Public Library of Science
PQP	Pompeii Quadriporticus Project
PZAC	Proyecto Arqueológico Zaña Colonial
QA	quality assurance
QC	quality control
QR	quick response
REVEAL	Reconstruction and Exploratory Visualization: Engineering meets ArchaeoLogy
ROS	robot operating system
ROV	remotely operated vehicle
RRN	Reciprocal Research Network
RSS	Rich Site Summary
RTK	real-time kinetic global navigation satellite system
SfM	structure from motion
SHPO	State Historic Preservation Office
SKAP	Say Kah Archaeological Project
SLAM	simultaneous localization and mapping
SMU	square meter unit/s
SU	stratigraphic unit/s
SVP	Sangro Valley Project
TCP	traditional cultural properties
tDAR	the Digital Archaeological Record
UAV	unmanned aerial vehicle
UNASAM	National University of Ancash, Santiago Antúnez de Mayolo
UQ	University of Queensland
USACE	U.S. Army Corp of Engineers
USBL	ultra-short baseline
USFS	U.S. Forest Service
USV	unmanned surface vehicle
UTM	universal transverse mercator
XML	Extensible Markup Language



5.1.
Response: Living a Semi-digital Kinda Life

Morag M. Kersel

After I received the initial email inviting me to contribute to papers considering the ongoing digital revolution in archaeological fieldwork, the following exchange occurred. With respect to digital archaeology, I consider myself a "Luddite outsider," to quote Caraher (Ch. 4.1). My initial hesitation:

> "I am honored and intrigued by your invitation. I was impressed by the line-up for your conference (which I followed via Twitter); it appeared to be a great set of papers engendering a lot of interesting discussion. I hesitate, wondering if I am really the right person to respond to these papers. I am no "digital guru" – I do use and see the merits of various technologies and databases and advocate for Open Context etc. . . . but there are many folks better versed than I in the topics."

The editorial response to my anxiety:

> "For our second respondent we were looking for a field archaeologist who would be able to comment on the usefulness, practicality, and value (or not) of these digital technologies in the field and analysis. Thus we were hoping you would be able to speak as an archaeologist that uses and implements digital technologies rather than as a creator of them."

I took this editorial charge to heart, and as such I will not comment directly on the sometimes very detailed technological aspects of the various contributions. I will admit that in examining the papers (I read the entire volume on an iPad, using GoodReader to annotate the PDF), I was often lost in the platforms, programs, and terminology used by the authors. Clearly there is a new language associated with digital technologies with which I am unfamiliar. In addition to the technical terms and programs I noted new "buzzwords" like granular, workflow, and born digital, which appear in almost every chapter. I was not "born digital," nor have I have been transformed into a completely digital being, but when the editors asked me to respond to the various papers from the National Endowment for the Humanities (NEH) funded workshop, I began to reflect on what it means to "live a digital life" vis-à-vis my own field projects.

I am an archaeologist working in the Eastern Mediterranean who has dabbled in the digital for a while. At the Galilee Prehistory Project of the Oriental Institute, the University of Chicago, we were early adopters of iPads in the field—in our 2012 season we used a single iPad as a test case, and in subsequent seasons each area supervisor had an iPad for all "in-field" recording. At the Early Bronze Age mortuary site of Fifa, situated along the Dead Sea Plain in Jordan, Austin (Chad) Hill and I were among the first teams to use drones, or unmanned aerial vehicles (UAVs) in the field. Equipped with cameras, the UAV flyovers at Fifa let us produce high-resolution digital elevation models, allowing us to use image-based modeling as a legitimate analytical tool for the monitoring of landscape change due to archaeological site looting (see also Olson, Ch. 2.2). I am—and have been since its inception—an avid supporter of the Alexandria Archive Institute and its web-based publication of research data, Open Context. When called upon, I attempt to provide intellectual insights on various ethical issues related to online publication and open access. But much of my work in and out of the field is still paper-based, either by design or by compliance (in both Israel and Jordan we currently are asked by the relevant antiquities departments to supply paper copies of our final reports on the field season). Spigelman, Roberts, and Fehrenbach (Ch. 3.4) point out the irony of having entirely digital in-field data workflows while the State Historic Preservation Office project compliance deliverables are required to be paper-based. Both Caraher (Ch. 4.1) and Kansa (Ch. 4.2) lament the failure of the academy to recognize digital publications as

valid contributions to a portfolio of work in tenure cases, which may add to our anxieties about moving to a completely paperless life. In this particular moment, as a discipline, I believe we live a semi-digital kinda life (à la Third Eye Blind, the US rock band formed in the early 1990s) where we are part paper and part paperless.

In the following response I want to highlight a few of the recurrent themes and some general observations that struck me as I perused this intriguing collection of papers. What does it mean to live a (either semi- or fully) digital life? What are the ethical implications associated with living a digital life? In the spirit of full disclosure, I would not have read this volume cover to cover under normal academic circumstances, preferring instead to cherry-pick chapters directly related to my research. I thank the editors for this unexpected invitation to contribute my thoughts and observations on archaeological fieldwork in the digital age.

Living a Digital Life

What does it mean to live a digital life? The chapters in this volume articulate the ways in which archaeologists can and do embrace the digital, and each provides a thoughtful and compelling analysis of the varied digital lives in places like Peru, Pompeii, coastal (underwater) Israel, Cyprus, and the American Southwest. These contributions demonstrate the global and temporal applicability of varied technologies to archaeological fieldwork. Many of the papers aver that going digital has resulted in a streamlined, systematized (Bria and DeTore, Ch. 1.5), efficient workflow, producing what Motz (Ch. 1.3) refers to as a data avalanche. Does this increase in productivity and capabilities improve our ability to interpret the archaeological record? Gordon and colleagues (Ch. 1.4) argue that data are now democratized, easily sharable and understandable, while Sobotkova and colleagues (Ch. 3.2) contend that real-time digital data allow for early detection of mistakes that previously may have gone unnoticed for an entire field season. Contributions to this workshop ably illustrate that digital methods are assisting not only in increased data recovery, but also in better data recovery (as there is less room for human error). I recognize that an impetus for many to lead a digital life is a "need for speed" as some archaeology is often carried out in advance of bulldozers, development, and situations of crisis and conflict.

In my "Introduction to Archaeology" classes, I start each academic quarter by showing the following standup skit by British comedian Eddie Izzard (2008):

> I love archaeology, it is like a detective thing—but it is very slow on telly: "We've been here 3 weeks on live television and we've dug a millimeter of topsoil so far" say men with brushes and beards. "We've found this and radiocarbon dated it to last Thursday, we are very excited." It's too slow for us, our attention spans are short, we need stuff, things, happening quick, quick—change the channel. We don't want slow archaeology, we want SPEED archaeology.

This amusing skit (which students love) encapsulates many of the tropes of archaeology culminating in a declaration of a need for speed archaeology—and many of the chapters in this volume assert that going digital results in just that: speed archaeology. "On the most basic level, using a digital format to record data would speed our data collection by eliminating the need to type paper records into a computer at the end of the day or season" state Bria and DeTore (Ch. 1.5) in a discussion of why speed matters. Technological advances make it easier and faster to record sites on a daily basis, to uncover features from the air (see Wernke *et al.*, Ch. 2.3) and from the sea bed (Buxton *et al.*, Ch. 2.4), and to replicate artifacts and sites (Dufton, Ch. 3.3; Olson, Ch. 2.2), thus freeing up time for greater reflection and discussion about the research goals and outcomes. Does this lead to more time for contemplation? Caraher (2015) suggests that with increased efficiency comes the increased temptation to dig more, which authors in this volume confirm. Dufton (Ch. 3.3) and Fee (Ch. 2.1) admit that the extra time garnered as a result of digital technologies did not always occasion further site/object contemplation but instead often brought about additional excavation and even larger amounts of amassed data. What are we doing with all of the data collected as a result of the digital revolution—are we publishing more? (I will return to this query below when discussing the ethical implications of living a dgital life.) I am also left wondering if the efficiency created by new technologies is really as liberating and progressive as practitioners proclaim. Nakassis (2015) and Caraher (2015) make an excellent case for the introduction of a different set of hierarchies as a result of digital

technologies. And indeed, do additional data result in better archaeology or just a different type of archaeology? Are we now freer as a discipline, or is there a greater entanglement with data and site that requires even more reflexive examination? Are we thinking more or just inputting and gathering more data?

I am an archaeological surveyor, and until the time of the digital revolution I was solely responsible for drawing the architectural plans, sections, and features at the various Neolithic/Chalcolithic/and Early Bronze Age sites where I work. In the last 10 years, my fieldwork life has transformed dramatically. Overall, I embrace this transformation as a good thing, although I do acknowledge that in the not-too-distant future I may be out of a job. Howland and colleagues (2014) suggest that less time-consuming and more accurate digitization from georeferenced orthophotographs has supplanted field drafting. The UAVs and iPads used to record the daily changes in our excavations at the Chalcolithic site of Marj Rabba in Israel (see Rowan and Kersel 2014) rendered my hand-drawn daily top plans obsolete. As many of the chapters (Ellis, Ch. 1.2; Gordon *et al.*, Ch. 1.4; Motz, Ch. 1.3; Poehler, Ch. 1.7; Wallrodt, Ch. 1.1, among others) in this compilation demonstrate, this move to the digital for field recording resulted in greater accuracy, consistency, and efficiency in the field (see also Roosevelt *et al.* 2015). At the Galilee Prehistory Project, the use of TouchDraw to annotate photographs taken with the iPad, which were then added to existing records in FileMaker Go, enabled supervisors and students alike the immediacy that going digital affords. No longer did area supervisors have to wait for me to draw the architecture, which they then transferred to the daily top plan for their area. Hampered only by overheating and/or glare (see Gordon *et al.*, Ch. 1.4, for further discussion around the physical limitations of using technology in the heat of the Eastern Mediterranean), the field seasons where we integrated a digital life at Marj Rabba were more efficient; but I continue to worry about what we are missing and how archaeology has changed through the use of an iPad and UAVs in the field.

In 1993, as Gila Cook, the longtime archaeological architect for the Tel Dan project in northern Israel, was dismantling her drawing equipment, she noticed something out of the corner of her eye. On the exposed tip of a basalt stone Gila observed some inscribed letters and exclaimed: "I looked again and said to myself, Oh! This is a qof, here's a mem Hebrew or Phoenician letters! It's an inscription . . . with

rows of characters" (for a full account of the discovery, see Cook 2003). An archaeological surveyor had discovered the Tel Dan inscription, a fragmentary Aramaic engraving referring to the "king of the House of David," one of the first archaeological finds supporting the existence of biblical figure of David. My point here is not to debate the veracity of the Bible vis-à-vis the Tel Dan inscription, but to wonder that if iPads and drones were in use at Tel Dan, would the inscription have been uncovered? As someone who draws thousands of stones each season, I often run my hands over features as I set up tapes—I am "up close and personal" with the site and its features. In addition to the excavators, supervisors, and directors, the surveyor can be another pair of eyes on the ground, but I acknowledge that so too can a drone be an "eye in the sky." At Marj Rabba we often identify features that we might/would never have seen from the ground from the drone images. We are carrying out more comprehensive archaeology (or what Olson and colleagues (2013) labeled "total archaeology") and leading a digital life, but I worry that in our preoccupation with a paperless life we might overlook the legacy of paper and a closer connection to the site.

I am uneasy about an overreliance on the technological, what some have identified as a type of fetishism (Huggett 2016). Cameras mounted on drones take thousands of images for a variety of purposes, including photogrammetry and daily site record keeping. Digital processes provide another view of sites and artifacts at a different scale from hand-drawn paper records. If we turn exclusively to aerial photography as a comprehensive recording technique, what are we missing? It is a misconception to think that because we have thousands of images we have captured all of the data necessary both to reconstruct and to answer questions about the past. Whatever the method used for data collection, we are always missing things and we need to acknowledge this rather than promoting technology as the liberator of all of our past paper-based wrongs.

In our "semi-digital kinda life" at the Galilee Prehistory Project, we did not embrace fully the digital model as I and the field-school students continued to produce, by hand, on paper, the final architectural drawings, elevations, and sections at Marj Rabba. We are, however, convinced by the "born-digital" brigade (and I more so after reading the contributions to this volume), and in our future projects we will probably go forward in a fuller digital mode while remaining

ever mindful of the lesson from Tel Dan and the words of Caraher (Ch. 4.1: 436):

> The removal of the time-consuming illustration process from excavation work does not necessarily guarantee the de-skilling of the excavator, but it certainly transforms a crucial step in the documentation process from one requiring detailed and careful knowledge both of the features in a trench and the conventions of illustration to one requiring the understanding of a digital camera and relevant software. The former is vital to the archaeological process whereas the latter is not.

The Ethics of Living a Digital Life

In April of 2015 I presented a keynote address at *The Future of the Past: From Amphipolis to Mosul* conference, held at the University of Pennsylvania Museum of Archaeology and Anthropology. My talk "Go Do Good! Responsibility and the Future of Cultural Heritage in the Eastern Mediterranean in the 21st Century" was both a call to arms for practitioners of cultural heritage management in the Eastern Mediterranean and an encapsulation of our ethical obligations as archaeological specialists. In my introduction I suggested "people need to come first, and while we rightly care about levels of science, of interpretation, and of knowledge acquisition, we should also be committed to the plight of humans as it relates to our practice as archaeologists" (Kersel 2016). Whether we are "born digital," semi-digital, or paper-based, our ethical obligations to the people, places, and objects with which we work remain the same.

Limited Access or Access for All?

The concept of "born digital" makes me anxious for the next generation of archaeologists. Gordon and colleagues (Ch. 1.4) assert that one of the logistical benefits of going digital is user-friendly technologies that allow for the recruitment of staff and students who have gown up with technology. In going digital, are we establishing an archaeology that excludes individuals who are not technologically inclined? Are we creating a digital divide between those with technological capabil-

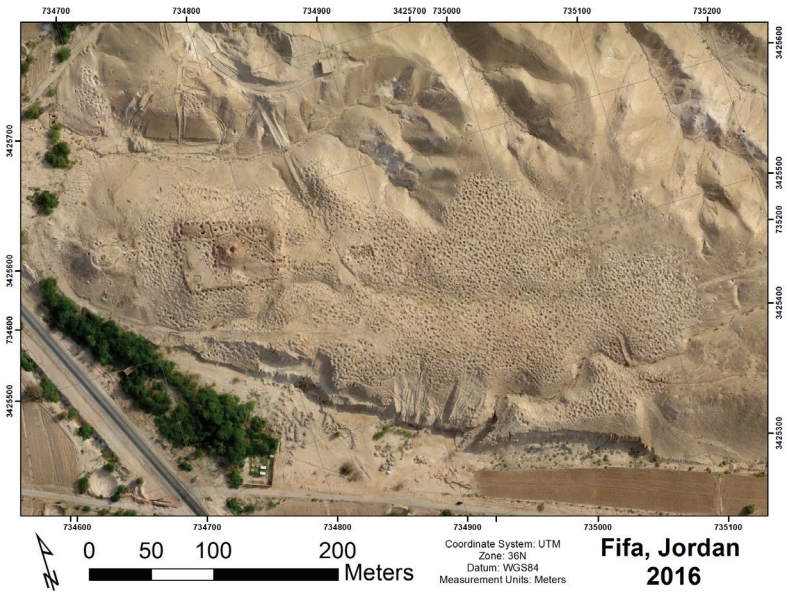


Figure 1: An orthophotograph map of Fifa, Jordan, showing cumulative looting damage as of 2016. This map is constructed from several hundred aerial images of the site, recorded with a fixed wing drone, and combined with the coordinates for dozens of measured points on the ground. (Image by Austin "Chad" Hill, courtesy of the Follow the Pots Project)

ities and those who want to dig in the dirt and/or walk a transect? Will future field-school students consist only of those with digital proficiencies? In one of the more introspective chapters of this volume, Sayre (Ch. 1.6) pointedly asks: "Who gets to use advanced technology?" In pondering the question of whether data driven efficiency results in less engagement at the trowel's edge, Ellis (Ch. 1.2) asserts that digital recording methods actually have resulted in greater engagement through the use of tablets in the field—they are the great equalizer: everyone can and does participate. But does everyone? In their discussion of the field-school students at the Athienou Archaeological Project, Gordon and colleagues (Ch. 1.4) state that a supervisor on the project asked a salient question regarding the use of technology for technology's sake rather than for the betterment of archaeological praxis. In a reflective blogpost on detoxing from the digital, Jeremy Huggett (2016) asserts that "Digital Archaeology should be a means of rethinking archaeology, rather than simply a series of methodologies and techniques" – digital archaeology should be about more than the tools and techniques. This is to say nothing of the digital divide between those who can afford the technologies and those who cannot. In the underwater digital project outlined by Buxton and colleagues (Ch. 2.4), they acknowledge that only through the assistance of the engineering team were they able to keep the costs to under $10,000 USD per week. Going digital is not for the faint of budget (see additional examples: Castro López *et al*., Ch. 3.1; Ellis, Ch. 1.2).

Recently, Chad Hill and I submitted a paper to a notable academic journal on our "do-it-yourself" (DIY) drones and the monitoring of looting at an archaeological site in Jordan. The purpose of the paper was to highlight the use of low-cost drones to produce images (see FIG. 1) depicting change over time at a site with ongoing looting and to provide details on affordable UAV technologies. We outlined the methods, the gear (DIY drones), and some successes and some failures. Reviewer A asserted :

> "Although low-cost tools (better called toys) allow for the capture of some airborne imagery, they are very prone to failure—low-cost approaches should not be simulated. Despite this, archaeologists keep on publishing papers with these low-cost UAVs and these low-cost, unreliable machines are doing anything but revolutionizing efficient site recording."

In rejecting the paper, the editor offered this suggestion: "the issue of 'professional' vs. 'DIY' or low-cost drones could be discussed as a positive aspect of your research in a different paper." We were, of course, disappointed with the rejection of the submission but we were more disheartened by the dismissal of the DIY aspect of our research. How will the average archaeologist, graduate student, undergraduate, or local department of antiquities carry out research if they do not command the financial wherewithal for the more expensive technologies? And if they attempt to DIY, will peers with access to more expensive technologies always consider their research results inferior? Is the digital revolution creating inequality in the archaeological workplace? This inequality, I would argue, reinforces the colonial binary of the wealthy West versus the less-developed places in which many of us work. Do we have to go big or go home? And what if we are home but have no access to resources? Are we then forced to partner with wealthy institutions/individuals (in or out of country) in order to be digital archaeologists?

Boys with Toys?

As I read through this fascinating collection, I noticed that many of the voices were male. Of the 44 authors, 34 are men and 10 are women: women make up 23% of the contributors. Of the 17 chapters, 10 are single-authored, all by men. There is one chapter co-authored by two women and six chapters co-authored by both women and men. Males were lead authors in 82.3% of the chapters, women lead in 17.7% of the entries. These statistics mirror closely the trend in major archaeological journals as outlined in a 2014 study by Dana Bardolph of 4,500 peer-reviewed papers in 11 archaeology journals over a 23-year period. Among the articles surveyed in the major journals, Bardolph found 71.4% were lead-authored by men, and 28.6% by women. Bardolph argues that the low rates of publication perpetuate a marginalization of female researchers in academia and demonstrate what she called "a pernicious historical bias with regards to the visibility, recognition, presentation and circulation of women's writing" (Bardolph 2014: 534). In no way am I qualified to write a feminist critique (I will leave that to learned colleagues like Dana Bardolph, Meg Conkey, Joan Gero, Rosemary Joyce, and Ruth Tringham) on the allegation that the field of digital technology is filled with "boys and their toys," but

I did consult an active practitioner in digital media and a scholar of feminist theory for confirmation on the gender statistics in digital archaeology. Colleen Morgan of the University of York, a digital media and archaeology specialist, confirmed that women are a minority in the field of digital archaeology. Are digital technologies adding to the bifurcation of the discipline, meaning is it males, most often white, who do digital and females who do something else? Is digital archaeology man's work?

I am infamous for calling out projects, colleagues, and peers for not having enough (or any) women on projects, publications, or panels. In an exchange on Facebook I commented on a post by my colleagues Yorke Rowan [also my husband] and Chad Hill in which 5 males were pictured with a caption about going off to fly drones in the eastern desert of Jordan. I remarked: "I think you are missing some women on that adventure," which I suspect is often the case in digital/technological archaeology—women and minorities are missing. In no way am I suggesting that particular archaeologists are deliberately excluding women and/or minorities; I think the historical legacy of archaeology and science in general as a male-dominated field has resulted in the present situation, but I want those who embrace of the digital revolution to recognize that these historical precedents may be reinforced by current practices.

A discussion of public archaeology and digital technology (an element I found lacking in most of the chapters in this volume) is a topic for another paper (see Morgan 2012 for a detailed synthetic analysis of the topic), and only Chapter 1.6 (by Sayre) provides a comprehensive consideration of community archaeology and the digital divide created by new technologies, which makes archaeology beyond the reach of the local Andean *campesino* in terms of access and expense. In their recent blogpost on decolonizing anthropology, McGranahan and Rizvi (2016) propose, "Our history is full of taking information from communities without enough consideration of the impact." As a discipline we need to consider our relationships with communities—the broad ranging definition of community—because I would suggest that digital archaeology may have the potential to segregate rather than foster inclusion, as demonstrated in the discussion regarding overcoming local mistrust in the chapter (Ch. 1.6) by Sayre. One way to do this may be through a variety of publication platforms.

While I found the gender imbalance (I fully acknowledge that I did not address the racial divide) disturbing, as a female in a male-dominated profession I was not surprised. I was however ~~surprised~~, no, shocked at the lack of engagement of what to do with the increasing amount of data produced as a result of these new technologies—most of the submissions stopped at the edge of the square or in the analysis stage of fieldwork; very few mentioned publication. In his excellent summation of the responsibilities of the Pompeii Bibliography and Mapping Project and the quest for an understanding of the past, Poehler (Ch. 1.7) states:

> we collect data,
> we analyze them,
> we interpret them,
> we synthesize them, and
> we narrate them.

Why does Poehler (Ch. 1.7) use *we narrate them* rather than the more direct *we publish them*? I concede fully that the focus of the workshop and subsequent volume was/is "Recent Approaches to Archaeological *Fieldwork* [emphasis mine] in the Digital Age," but I see fieldwork and publication as inextricably linked, and until we inculcate this position as a standard in the discipline, many are free to split the praxis of archaeology, thereby obscuring the need to publish. As Kansa (Ch. 4.2) eloquently states, traditionally varied funding mechanisms have cultivated this partition by continuing to sponsor fieldwork, new technologies, and analyses but by not providing much, if any, support for publication. This divide between fieldwork and publication has led to a discouraging predicament: the ongoing failure to publish the results of our research in a timely and accessible manner. If we are producing more data, faster, we should also be thinking about sharing our findings in a greater number of appropriate venues. After all, is not the raison d'être of archaeology knowledge production and its dissemination?

More than any other aspect of the discipline of archaeology, the production of digital data lends itself to SPEED publication (à la Eddie Izzard). Online digital repositories like Open Context concomitant

with the recent requirements by both the NEH and National Science Foundation (NSF) for the inclusion of data management plans in grant applications should be the perfect storm for timely publication. At a very minimum, "data sharing as publication" (see Kansa, Ch. 4.2) should be the standard for all archaeological projects, and if an end result of digital technologies is immediately available data (as described by Ellis, Ch.1.2), each of the entries in this volume should have emphasized their data management plans and the publication of data through an online platform as part of any discussion of technology and fieldwork. I agree with Kansa (Ch. 4.2) when he reminds us that our commitment to the archaeological record does not stop with the bureaucratic NSF and NEH digital-management compliance. Requiring data management as part of funding is an excellent first step in meeting our ethical obligation to publish our findings. We still need to intellectually engage with, scrutinize, interrogate, inspect, synthesize, and *narrate* the data we deposit; but at the very least, web-based digital repositories should be a part of our digital (or semi-digital) lives.

I want to end with a recent case study in digital technology that I believe underscores some of the ongoing tensions between digital and semi-digital forms of archaeology and the need for a clearer articulation of why archaeology (digital and/or other forms) matters.

Why Do Digital? A Case Study in 3D

In April 2016, a two-thirds scale 3D model of the gate from the Temple of Bel at Palmyra was erected in London's Trafalgar Square. At the unveiling of the structure, then London Mayor Boris Johnson told spectators that they were gathered "in defiance of the barbarians [DAESH]" who destroyed the arch in the city located north-east of the Syrian capital of Damascus (Turner 2016). Vociferous discussion erupted in the digital "Twittersphere" surrounding the purpose, the utility, and the relevance of the 3D model.

> Tweet 1: "Palmyra arch 1/3 scale model surrounded by white men in suits congratulating each other #heritage" (@GabeMoshenka, April 19, 2016, 7:56am)

Tweet 2: "3D toy-archaeology in a wildly imperialist setting proves that WE are the civilized ones and THEY are the savages" (@GabeMoshenka, April 19, 2016, 8:06am)
Tweet 3: "HUGELY EXPENSIVE toy arch says exactly how much we value faux antiquity over helping living people :(" (@Eleanor_Robson, April 19, 2016, 8:09am)
Tweet 4: "Not even about archaeology, it's fun 3D print toys for boys." (@cwjones89, April 19, 2016, 8:10am)
Tweet 5: "It is technological fetishism at its worst" (@jobbew Apr 19, 2016, 8:49am)
Tweet 6: "LET'S TALK ABOUT DIGITAL COLONIALISM. #london #palmyraarch #palmyra #TrafalgarSquare." (@morehshin Apr 19, 2016, 3:57pm)
Tweet 7: "What's the Value of Recreating the #PalmyraArch with Digital Technology? #London" (@historylizer April 20, 2016, 8:20am)
Tweet 8: "Palmyra arch in Traf. Sq. without a shred of info for the visitor. Crowd of baffled tourists mostly asking what it is?" (@GabeMoshenka, April 20, 2016, 11:03am)

How is producing a 3D model of a destroyed architectural element from Syria archaeology? What does creating an isolated replica actually contribute to our understanding of the people of Syria, the history of Syria, and the archaeology of the Roman period, particularly if there were no accompanying signs to explain the meaning and/or purpose of the arch? As Christina Luke and I articulated in our 2013 volume on archaeology and cultural diplomacy, archaeologists and their work are used in various guises, in ways we least expect, which are often far removed from our original intent and goals (Luke and Kersel 2013). In this digital moment, the 3D model of the arch from Palmyra was used to demonstrate that the West cares about culture—a media moment timed to coincide with World Heritage Day. But the moment could have been so much more: the 3D arch could have served as proxy for future collaborations with the people of Syria on the protection and conservation of their cultural heritage.

Conclusions

At the Council for British Research in the Levant conference, *The Past in the Present of the Middle East* (April 2016), Eleanor Robson suggested that it was healthy to be self-conscious about what we do, and to ask ourselves "What are we doing locally and what are we doing with data we collect?" Her comments are particularly pertinent with respect to digital archaeology. After reading this volume, I am convinced that digital technologies have the propensity to create and/or reinforce divisions between males and females, developed and less-developed nations, and practice and theory. As a discipline we need to acknowledge these ruptures and work toward bridging the divides. Digital archaeology appears to be largely uncritical in execution, with a focus on equipment, platforms, and programs. Evaluation has been limited to debates over DIY versus professional, issues over standardization, and sometimes about output. This lack of self-assessment has left "archaeologists open to accusations of technological fetishism" (Huggett 2016, and see Tweet #5 above). While these same statements can be and have been leveled at paper-based archaeology, I was asked to provide my thoughts on the digital.

There is an absence of self-reflection in this volume's compilation, but there is still time, time to think about why we do what we do and how we could be doing it better. How will we use our innovations to "catalyse, support, develop, and enhance" (Huggett 2016) our production of knowledge about the past in order to make archaeology relevant in the 21st century?

With all due respect to the authors, editors, and participants in this volume and the amazing achievements in visualization, data storage, collection, documentation, and informatics demonstrated here (I am in awe of the body of knowledge and technological know-how displayed), I think now is the time to step back, to consider the "slow archaeology" of Caraher (Ch. 4.1) and contemplate our ethical obligations to publish (Kansa, Ch. 4.2); we must also take heed of the ethical responsibilities we have toward the communities with whom we work (Sayre, Ch. 1.6). We need to think through the additional layers that digital archaeology adds to our vocation.

I want to return to the question of what we might be missing when we are completely digital. In the influential paper by Roosevelt and colleagues (2015) on the "born-digital" Kaymakçı Archaeological

Project in western Turkey, the authors suggest that digital technologies assist in removing layers of abstraction. But in removing these layers without theoretical reflection, are we obfuscating the messiness of archaeology? Are we less creative in the field now that we can and do provide millimeter accuracy in our documentation? Does being one millimeter off in our calculations mean that the archaeology and the interpretations were poorly executed? Do we need room to be wrong?

The future is bright, very bright for digital archaeological fieldwork and data collection, but there is still work to be done. In many respects it is a good predicament that we are in a "semi-digital kinda life." There is time to improve and to expand and to include missing elements into digital archaeology.

Acknowledgments

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