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5.2. Response: Mobilizing (Ourselves) for a Critical Digital Archaeology

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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
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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]

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[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-

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 livestream. 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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October 1, 2016
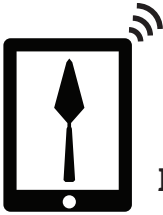
How To Use This Book

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
PAZC	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
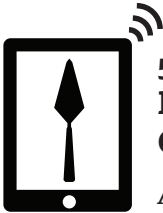
5.2.
Response: Mobilizing (Ourselves) for a Critical Digital Archaeology

Adam Rabinowitz

Nous déclarons que la splendeur du monde s'est enrichie d'une beauté nouvelle: la beauté de la vitesse. Une automobile de course avec son coffre orné de gros tuyaux, tels des serpents à l'haleine explosive . . . une automobile rugissante, qui a l'air de courir sur de la mitraille, est plus belle que la *Victoire de Samothrace*.

<div align="right">Filippo Tommaso Marinetti, Le Figaro, February 20, 1909[1]</div>

A Distant Digital Approach to "Mobilizing the Past"

Since the contributions in this volume revolve around the relationship between information and digital data in archaeology, it seems appropriate to begin by turning the volume itself into data to explore the results. The emerging discipline of Digital Humanities, when it is used in literary fields, treats words in a text as a series of data points, which when viewed in the aggregate ("distant reading": Moretti 2005: 1) can show patterns invisible to the close reader. Distant reading techniques such as topic modeling have been applied to archaeological discourses by Shawn Graham, and I follow Graham here in the notion that the words and syntax we use to talk about archaeology can illuminate our underlying interests or preoccupations.[2]

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[1] "We declare that the splendor of the world has been enriched with a new beauty: the beauty of speed. A race-car with its hood adorned with huge exhaust pipes, like serpents with explosive breath… a roaring automobile, that seems to run on grapeshot, is more beautiful than the *Victory of Samothrace*."

[2] Graham's work in this area initially focused on archaeological databases (see his project statement on the Portable Antiquities Scheme (https://finds.org.uk/research/projects/project/id/375), but it has more recently turned to the analysis of site diaries, using material from Kenan Tepe stored in Open Context (e.g., https://rpubs.com/shawngraham/79365). For an overview of the tools, see Graham *et al.* 2012.

I am a novice in this area, so when reviewing the contributions in the present volume, I took advantage of two Web-based platforms that require very little specialized knowledge for basic text analysis and visualization: Voyant Tools and the collocation tool in the TAPoR toolkit.[3] I copied the text of the contributions from a PDF to a text file, deleted the figure references and bibliographies, and fed the results into those two platforms. Both platforms automatically remove the usual set of "stop-words"—commonly-occurring words like articles and prepositions that would otherwise dominate the results of frequency counts—and I added to this list a group of words that appeared with disproportionate frequency in this volume: predictably, "digital," "data," "archaeology," and "project", along with "et" and "al" from the parenthetical citations.

The result confirmed the impression I had while reading the manuscript. One of the words that remained at the top of the frequency list after all stop-words were removed was "time." Time, in fact, is a constant presence throughout the diverse chapters of this volume, from the efficiencies described by the contributions in Part 1, to the tools that now allow us to do in hours tasks that would have taken months a few years ago in Part 2, to the time needed for development, customization, and technical support in Part 3, to the final comments on the slowing of time in both archaeology and data management in Part 4. As I read the contributions, I felt, on an almost physical level, the attraction to the increased speed of our digital tools. The brakes applied to that momentum in the chapters by Caraher (Ch. 4.1) and Kansa (Ch. 4.2) only underline its power.[4] My simple distant reading of the text as a whole suggests a sense of time as a limited commodity: in the TAPoR platform, among the most frequent collocations of the 241 instances of the word "time" were variations of the word "save" (save, saving, savings, saved: 19 instances), "spend" and "spent" (11 instances), "-consuming" (eight instances), and, at the bottom end of the most frequent collocations, "cost" (five instances). The other top collocations were "data" (18 instances), "development" (15 instances), and "real" or "real-" (as in "real-time": 13 instances).

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[3] Voyant Tools: http://voyant-tools.org/; TAPoR: http://taporware.ualberta. ca/~taporware/textTools/collocation.shtml?.

[4] Caraher's ongoing work continues to highlight this issue; see https://medi- terraneanworld.wordpress.com/2016/04/25/6086/.

Time is, of course, both the object of fascination and the principal adversary of the archaeologist. Archaeology is by definition an attempt to recapture lost time—to recreate moments in the past through the analysis of traces time has failed to erase. And it is time, through the law of entropy, whose passage causes both our evidence and our documentation to decay; time that is always in too short supply when we are in the field; time that is consumed in alarmingly large chunks as we prepare the results of our research for publication. We are not alone in our preoccupation with time, however: the digital revolution brought about by the personal computer, the Internet, and the smartphone also revolves around time. The ever-increasing speed of computer processors allows our calculating machines to become smaller and faster; advances in fiber optics and wireless connectivity allow bits to be transferred at greater and greater rates of speed; in the world of work, efficiencies produced by digital platforms allow fewer people to do more work in less time. Our own sense of time has changed in response, as anyone who remembers dial-up Internet can attest. However much we embrace the need for slowness in theory, we still become frustrated when a streaming video stops to buffer or an operating system is slow to boot up. We have become addicted to digital speed.

The dialogue between archaeological and digital attitudes toward time provides one central theme of this response chapter. The intersection between time and money is another. Kansa's allusion to Frederick Taylor, the thinker behind the science of business management and the assembly line in the early 20th century (Ch. 4.2), is not simply a thought-provoking analogy: it reminds us that the work of archaeology in this century is deeply entangled with an economic system—capitalism—that is also responsible for the design and production of the digital tools we use. Although economies and tools have always been enmeshed, the paper, writing instruments, cameras and film of the analog era were not as closely coupled as our digital tools are to the agendas of corporate entities that prosper through constant innovation and change. There are only a few ways in which one can disrupt a pencil.

Two hundred and fifty years have passed since the excavations of the Quadriporticus at Pompeii (Poehler, Ch. 1.7). For 230 of those years, field documentation practices remained largely unchanged: archaeologists took notes using pen or pencil and paper, measured

features with tapes and plumb-bobs, surveyed with transits and optical theodolites, and drew plans and sections by hand. Only one major technological advance took place during that time: the introduction of photography 60 years after the Quadriporticus excavations began, 190 years before the present. The dumpy level described in John Droop's 1915 excavation manual (Droop 1915, 11–12) was still in use when I dug at Cosa in 1995, 80 years later. But in the decade that followed, we moved from the adoption of basic digital databases to GIS-based, total-station-driven digital integration of relational and spatial data; and in the decade since, we have moved from digital photos, GIS, and the digitization of paper context sheets to the routine use of tablets and high-density survey and measurement techniques (HDSM; see Opitz and Limp 2015).

The combination of the rapid pace of technological change over the last two decades and the relative lack of theory in our consideration of our own documentation practices have left us poorly equipped to understand the effects our new digital tools are having on our ways of seeing and thinking.[5] We can immediately see how they help us do better what we have been trying to do, as archaeologists, for the last 200 years; we have a strong—but still somewhat inchoate—sense that they will help us go beyond those things we have traditionally attempted to do; but we seem to have very little sense at all of how they are shaping and constraining what we choose to look at, what we are able to see, and how we describe our observations. Yet the contributions to this volume make it abundantly clear that we are not just witnessing a change from one recording medium to another, like the transition from film to digital photography or from typewriters to word processors. What we are seeing is a more fundamental transformation of our knowledge-production practices—a paradigm shift

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[5] This is not to say that there has been no consideration of archaeological documentation, but rather that theoretically informed analyses have appeared only fairly recently, and they are still catching up with the transformation of context-based paper systems after Harris's introduction of single-context recording and his eponymous matrix (Harris 1979). See, e.g., Lucas 2001; Pavel 2010 (cited several times in this volume); and Cobb *et al.* 2012. The theoretical consideration of photography took even longer: although it was integrated into archaeological practice by later 19th century, it was not until the 1990s that a serious inquiry into the highly constructed nature of archaeological photography began (Shanks 1997; Shanks and Svabo 2013; Carter 2015).

analogous to those caused by the introduction of the printing press or the ground-glass lens.

With that recognition we are faced with two paths. For the first, we can simply celebrate our advances—but in that case, a book like this will rapidly become a fossilized historical document like Droop's field manual, capturing a moment in the development of our discipline and inspiring the occasional reader to chuckle at the quaintness of our gadgets (A tablet you type into! A drone that stays aloft only for an hour!). The methods themselves, based as they are on ephemeral digital platforms and equipment, will quickly be outdated. I know this to be true from personal experience: within five years, the online publication of our stratigraphy from excavations at Cosa (Fentress and Rabinowitz 2003), retrofitted from a print model and novel at the time for an academic press, was being critiqued for its lack of data integration (Heinzelmann 2008), and within less than a decade, the publication of our "cutting-edge methods" at Chersonesos had been left far behind by PhotoScan-based 3D documentation workflows (Rabinowitz *et al.* 2007; cf De Reu *et al.* 2013; Olson *et al.* 2013; Roosevelt *et al.* 2015; see also: Castro López *et al.*, Ch. 3.1; Olson, Ch. 2.2; Wernke *et al.*, Ch. 2.3). If any theoretical framework can be associated with our wholehearted embrace of the potential of digital tools, I suspect it will eventually be called something like "New Archaeological Empiricism," and despite our protests, it will be a large and slow-moving target for the projectiles of the next generation of social theorists.[6]

The second path, I think, will give our current discussions a much longer use-life. Instead of treating our current practices as a triumphal step along the march of progress toward greater archaeological truth,

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[6] Just as the technical aspects of Digital Humanities, despite its much richer body of reflexive critical thought, have recently been attacked in a controversial article in the *Los Angeles Review of Books* (Allington *et al.* 2016); see the response by Matthew Kirschenbaum on Medium [https://medium.com/@mkirschenbaum/am-i-a-digital-humanist-confessions-of-a-neoliberal-tool-1bc64caaa984#.46ty2dd2p] and the tidal wave of other reactions to this article summarized by Digital Humanities Now [http://digitalhumanitiesnow.org/2016/05/editors-choice-round-up-of-responses-to-the-la-neoliberal-tools-and-archives/] and dh+lib review [http://acrl.ala.org/dh/2016/05/05/neoliberal-tools-and-archives-a-political-history-of-digital-humanities/]. Of direct relevance to this volume is Caraher's own commentary on the piece (https://mediterraneanworld.wordpress.com/2016/05/03/digital-humanities-and-the-new-liberal-arts/).

we need a wake-up call that stirs us from our enraptured contemplation of speed, efficiency, accuracy, and three- or even four-dimensional digital surrogacy. We need to think, as many of the contributors to this volume do, about what we are sacrificing along with what we are gaining from digital methods. We need to think about who is included and who is excluded by this changing practice. We need to think about why we do archaeology, and how our dependence on tools that are not necessarily made for our benefit constrains, as well as expands, our ability to look at the past. We need to think about the role that money and power play in shaping our relationship with digital approaches. In short, we need a Critical Digital Archaeology.[7] We need a manifesto.

<div align="center">Three Manifestos</div>

Luckily, we already have one, as a number of the contributors to this work have pointed out: Jeremy Huggett's "Manifesto for an Introspective Digital Archaeology" (Huggett 2015; see especially Dufton, Ch. 3.3). Huggett, who moves equally comfortably in the Digital Humanities, clearly understands the reasons that field has already produced a Critical Digital Humanities movement, and his manifesto raises many of the general issues that we should be addressing as we take advantage of tools that existed only in optimistic science fiction 20 years ago. I would like to push Huggett's manifesto a little further, however, and place it in the context of two other manifestos, one old and one new. Together, these three manifestos can help to frame the contributions to this volume and elucidate the ways in which its four parts work together. They offer three complementary perspectives from which we can view the current state of digital archaeology: celebratory, reflective, and cautionary.

The Celebratory Manifesto

This chapter began with an extract from the first of these manifestos: Filippo Marinetti's "Manifesto del Futurismo," the well-known

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[7] I cannot imagine I have coined this term, despite its apparent absence from the published record, and in fact Google tells me that Lorna Richardson used it in a tweet during the CAA conference in Oslo in April 2016: https://twitter.com/lornarichardson/status/716120246545956864.

Futurist position statement that first received widespread attention when it was published in French in *Le Figaro* in the spring of 1909.[8] If we leave aside its explicit misogyny, its foreshadowing of Fascism, and its deplorable endorsement of violence, it is possible to see in Marinetti's manifesto a reflection of our own moment. The Futurist artists, like us, lived at a moment of rapid and disruptive technological change, a time when not only daily life but entire traditional systems were being transformed or torn apart by new ideas and new devices. They saw around them institutions and individuals who were slow to adapt, entrenched in traditional ways of doing and seeing, aesthetically and intellectually conservative, and resistant to the potential of new technologies, and they wanted to shake them from their slumber or run them over—as do the visionaries of Silicon Valley and their prophets of disruption, at the extreme end of the spectrum, but also, on a milder level, as do many of us who embrace digital technologies in our disciplinary practice. We have similar conversations about academic publishing, about tenure committees and university administrators, and about funding agencies.

Even the specific targeting of archaeology in the Futurist manifesto ("we want to deliver Italy," writes Marinetti, "from its gangrene of professors, archaeologists, tour-guides and antiquarians") finds certain parallels in the current discourse of digital archaeology. Roosevelt and colleagues have mounted a direct assault against the archaeological truism that "excavation is destruction" (Roosevelt *et al.* 2015: 325–326). A panel at the annual meeting of the Society for American Archaeology held in 2016 focused on the same topic, taking as its starting point a paper critiquing the reflexive habits that insist that all walls and floors at certain sites be preserved, no matter how unimportant they are or how much new information they prevent us from recovering.[9] And the Institute for Digital Archaeology can claim, in the face of damage wrought to the remains of Palmyra by ISIS—a group frequently described as "medieval" and opposed to

[8] A digital facsimile of the newspaper page bearing this manifesto is available at http://gallica.bnf.fr/ark:/12148/bpt6k2883730/f1.image.

[9] The panel was entitled "'Destruction' and the Rhetoric of Archaeological Excavation"; it was organized by Rachel Opitz, Nicola Terrenato, and Gregory Tucker, and the latter two provided the position paper, entitled "Architecture, Epistemic Conservation and Ideological Biases in Pluristratified Urban Sites: The Case of Roman cities in Italy."

modernity—that the digital documentation and reconstruction of archaeological monuments "can put these crucially important repositories of our cultural identity and shared history forever beyond the reach of those who would destroy them."[10] Futurism, in the minds of the artists who created it, would save Italy from the fetishists of the past. Similarly, digital archaeology, by releasing us from a single-minded Victorian focus on the authenticity of ruins frozen at a single moment in time, will save us from the current fetishization of the physical remains of the past as things to be utterly preserved or utterly destroyed. Rachel Opitz and Fred Limp have recently summarized this notion in pragmatic terms: the widespread adoption of new tools and techniques for HDSM will give us unprecedented access to the "thing-ness" of archaeological remains in an entirely digital form (Opitz and Limp 2015: 357).

And, of course, the Futurist Manifesto concerned itself with the speed, power, and potential of new machines. Through that focus, it truly did foster the development of new ways of thinking, seeing, and creating. It is thus an appropriate frame within which to celebrate the potential of our own new archaeological machines, whatever form of documentation—words, pictures, coordinates, point clouds—they are designed to capture. I mean this sincerely, as an enthusiastic user of digital tools in my own archaeological practice. While I share Caraher's concern with the "de-skilling" danger inherent in friction-less digital platforms for data collection (Ch. 4.1), I have also been responsible for several projects in the field, and I have rarely hesitated when offered a chance to do more with less. The paperless, tablet-based workflows described by Wallrodt (Ch. 1.1), Ellis (Ch. 1.2), Motz (Ch. 1.3), and Fee (Ch. 2.1) indisputably avoid the duplication of labor inherent in the transcription of paper records into a digital data-base. At Chersonesos, our trench supervisors spent many evenings typing their context sheets into first a Microsoft Access and later an

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[10] See http://digitalarchaeology.org.uk/our-purpose/; see also http://www.theguardian.com/commentisfree/2016/mar/29/palmyra-message-isis-is-lamic-state-jihadis-orgy-destruction-heritage-restored. This is not an uncontroversial stance: a debate over the colonial implications of the recon-struction of the Triumphal Arch at Palmyra and its installation in Trafalgar Square is playing out as I write (e.g., http://theconversation.com/the-mid-dle-east-heritage-debate-is-becoming-worryingly-colonial-57679), and it has been argued that ISIS is in fact much more like the Futurists in its embrace of new technologies in the service of an ideology of violence (Harmansah 2015).

Archaeological Recording Kit (ARK) database (see Dufton, Ch. 3.3), and when they inevitably fell behind on this work, we all had to spend additional time sorting out the mistakes that crept in as the backlog of paper documents mounted.

The advantages of a well-designed digital form with consistent vocabularies are also manifest: although we used digital data collectors with our total stations in the field at Chersonesos, we did not have preset vocabularies, with the result that we preserved an excellent record of human variability in the description of find types, but a rather less useful record for search and filtering (to map all the coins recovered from the excavation, e.g., one needs to filter the finds layer in the geodatabase for not only "COIN" but "3.COINS," "BRONZE.COIN," "BROKEN.COIN," and so on). Occasionally this resulted in labels that are likely to create future confusion, as with a small copper-alloy rod that was enigmatically categorized in the data collector (and thus the geodatabase) as a "PUKEN." The defined-value fields in a tablet-based system prevent this sort of user error from occurring, and even in situations where it is possible, the synchronization of different data streams makes it much easier to discover inconsistencies before they are propagated (see Sobotkova *et al.*, Ch. 3.2). Even more immediate are built-in validation tools like those described by Fee for PKapp (Ch. 2.1), which prevent users from making data entry mistakes in the first place.

"Real-time" validation and data integration are, in my opinion, among the most significant advantages offered by the paperless systems discussed in this volume. The frequency of the phrase "real time" in my basic textual analysis is indicative of the importance of this concept in paperless workflows. Here the beauty of digital speed shines brightest. For most of the 20th and well into the 21st century, information collected in the process of archaeological excavation jelled slowly and centrifugally. This remained true even after the adoption of digital technologies for documentation, as Wallrodt (Ch. 1.1) explains in his review of the history of digital fieldwork. By contrast, the syncing of visual, spatial, and textual records as they are collected by multiple users in the field and lab prevents data loss or corruption and, as Ellis demonstrates (Ch. 1.2), enables an interdisciplinary conversation between excavators, supervisors, and material specialists that can inform not only interpretation but excavation strategy in mid-stream. Here, the advantage of mobile devices lies in their form

factor: even while acting as cameras, GIS platforms, and multi-user synchronized databases, these devices are still small and light enough to be carried around like notebooks. When one adds instant access to the sort of vast archives of previous records and publications that Digital Pompeii offers, Poehler (Ch. 1.7) is absolutely right to claim that a new dimension of "trowel's-edge" interpretation opens before us.

This new interpretive dimension is not just richer in information. It also offers greater opportunities for the democratization of archaeological interpretation in the field. This has long been a concern for Ian Hodder and other archaeologists who are interested in the internal hierarchies of archaeological research, in which the diggers—either local workmen or field-school students—are usually at the bottom, while those who weave together the various strands of evidence to create the story of the site are at the top (Berggren and Hodder 2003). The contributions of Gordon and colleagues (Ch. 1.4) and of Bria and DeTore (Ch. 1.5), as well as those of Ellis (Ch. 1.2) and Motz (Ch. 1.3), put the experiences of the students in the foreground, highlighting the way in which mobile devices provide integrated access to information not only to the director or supervisors, but also to the students themselves. Bria and DeTore's account of the way that their mobile database enhanced their students' ability to formulate sophisticated, self-directed, multidisciplinary projects is particularly compelling. Sayre's contribution (Ch. 1.6) goes even further in its description of the ways in which mobile platforms can help to mediate inequalities between foreign archaeological teams and local populations. The instructional potential of mobile recording systems increases dramatically when students and local collaborators are included as partners in the development and testing of these systems, and in the creation of the vocabularies and ontological frameworks that underlie the databases they use.

We should celebrate, too, the growing capacity of the sensors on our archaeological machines and the increasing computational power that makes it possible to apply ever more complex algorithms to the information they capture. The chapters by Olson (Ch. 2.2) and Wernke and colleagues (Ch. 2.3) neatly lay out the result: the transformation of a large number of high-definition digital photographs into a photorealistic 3D digital model of an entire site and its stratigraphy at millimeter-level accuracy. Processing power is still an issue, but

requirements for time and human intervention have dropped precip-
itously (in 2007–2008, we employed a recent University of Texas
graduate for months to manually match points to make fewer than
a hundred 3D context models for Chersonesos using PhotoModeler;
with PhotoScan, models of comparable quality can be created from
the same sets of photographs in less than an hour apiece).

Nowhere are the possibilities of this new world of recording more
apparent, however, than in the description of the Pladypos system
offered by Buxton and her colleagues (Ch. 2.4). The mapping and
recording systems involved are analogous to the drone-based sensors
described by Wernke and his colleagues (Ch. 2.3). What is more
apparent here, however, is the potential for autonomous action on
the part of the recording machine. Drones can fly pre-programmed
patterns, of course, but Buxton's article—and the ability of nautical
ROVs (remotely operated vehicles) to function independently for
longer periods of time than current UAVs (unmanned aerial vehi-
cles)—made clearer the distinction between a machine controlled by
a human operator and a machine carrying out recording essentially
on its own, with the information it collects then being extracted and
processed algorithmically. A few rounds of algorithm development
down the road, and perhaps the machine could be trusted to make its
own decisions about site identification and recording;[11] a few rounds
after that, and perhaps it could be trusted to autonomously recognize,
record, and extract certain types of objects. At that point, we have a
robotic nautical archaeologist. A few more leaps forward in tech-
nology would probably be required for the emergence of a robotic
terrestrial archaeologist, though watching a computer-driven router
carve the architectural decoration of a copy of Palmyra's Triumphal
Arch, one might be forgiven for imagining a machine that documents
and removes stratigraphic layers by itself, using an array of sophisti-
cated sensors coordinated with robotic excavation limbs. Olson (Ch.
2.2) notes that volumetric modeling of stratigraphy on the basis of 3D
photogrammetry "can take the human element out of stratigraphic

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[11] The sort of machine-learning/neural-network/artificial intelligence ap-
proach that this entails does not seem so far off: some projects are already
combining adaptive pattern-recognition algorithms with crowdsourced
information to extract data automatically from satellite imagery. See, e.g.,
the MicroMappers wildlife challenge: https://irevolutions.org/2015/02/09/
aerial-imagery-analysis-combining-crowdsourcing-ai/).

recording." How long will it be before we are able to remove the human element altogether? And will we want to?

The Reflective Manifesto

Computers are better than humans at carrying out mathematical operations, a facility that extends to the organization and retrieval of digital data. Electronic and digital sensors are better than humans at perceiving and recording many of the qualities of the physical environment, especially when it comes to measurement. Since the measurement, recording, and organization of data are the primary goals of the process of archaeological documentation, why not turn this over to computers? What do humans have to offer to this process?

The answer to this question lies in the distinction between data, information, and interpretation. Machines can collect data, and they can begin to integrate them into the contextual systems that we think of as information, but they cannot perform the leap of informed imagination that enables the human archaeologist to propose explanations for why and how a stratigraphic deposit was formed, and they cannot (yet) tell the stories that archaeologists must create to explain the history of a site. Since, however, both the imaginative leap and the resulting story are a result of a close physical engagement with the material remains, and since they are both part of a process that involves a human being creating information at the trowel's edge and then filtering and transforming it for representation to other human beings, it is worth asking how the out-sourcing of some of the components of documentation to digital tools will affect the information we produce and the stories we tell. Here we arrive at the second manifesto: Huggett's 2015 essay.

Like Hodder's calls for a reflexive archaeology (Hodder 1997, 2003), Huggett's article asks us to think more critically about the interaction between our tools, our practices, and the knowledge that we seek to create: to develop "a form of introspective or more self-aware Digital Archaeology, one which consciously seeks to understand the underlying processes and behaviours that sit behind the tools, technologies, and methodologies applied" (Huggett 2015: 89). Hodder and his collaborators are currently concerned with some of the same issues, but their emphasis on the advantages of digital recording for the preservation of multivocality and the democratization of process takes a

distinctly more celebratory tone (Berggren *et al.* 2015). Huggett, by contrast, argues that we should be aware not only of the doors digital technology can open, but of the other doors it closes.

Huggett's essay deserves to be read in its entirety, but I want to highlight here two recurrent themes: distance and categorization. As with the "distant reading" I performed on this volume at the beginning of this response, digital tools give us the ability to take an ever-more-distant vantage point from which to observe archaeological remains, from the perspective of a satellite to a 3D model of stratigraphic deposits viewed on a monitor in the lab. Huggett suggests that this perspective, while giving us greater access to information, also decreases the intimacy of our engagement with the object of our study. Moreover, "distant reading" approaches in literature reduce texts to pre-defined component parts, sense-units consisting usually of single words—but not all words, as some are excluded *a priori* as too frequent to be relevant. Database-driven digital recording systems, both spatial and textual, perform similar operations: they define in advance what sorts of data and information are relevant and how they should be described, limiting space to coordinates and vectors and attributes to defined values. Uncertainty, fuzzy boundaries, and uncategorizable features can be lost in the process (Huggett 2015: 90–93).

These are theoretical issues that one can explore in the field through systematic user-testing and comparative study, and indeed, many of the contributors to this volume have done so.[12] But there is a related area that might require less impressionistic investigation: the cognitive science of embodied human-computer interaction, specifically as it relates to touch and input devices. A growing body of scientific literature focuses on haptics, or the physical engagement of a human hand with a tool or device, and in particular on the different ways in which we process information when dealing with different writing tools (Mangen and Velay 2010, 2012). Most of this work has focused on the cognitive effects of handwriting, either as it is connected to the engagement of multiple centers of the brain in the process of learning to read and write (James and Atwood 2009; Long-camp *et al.* 2011; James and Engelhardt 2012; Kiefer *et al.* 2015), or as it is involved in the brain's ability to process and retain information

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[12] It is also worth mentioning the long-term and farsighted program of testing at the Silchester Roman town site: e.g., Warwick *et al.* 2009.

through note-taking (Mueller and Oppenheimer 2014). The frame that researchers in this field have applied to the interaction between brain and hand(s) in writing is "embodied cognition" (Mangen and Velay 2012: 406), a theoretical concept that has already been used in the interpretation of past material culture (cf. Piquette and Whitehouse 2013), but which we have only just begun to apply to ourselves (Olsson 2016; Wright and Morgan, forthcoming). We should: not only do functional magnetic resonance imaging (fMRI) results from the studies mentioned above suggest that the input mechanism we use affects our processing of the information we input, but a few references in the recent medical literature on strokes suggest that engagement with text input on mobile devices uses a different part of the brain from that which otherwise processes language (Kaskar *et al.* 2013; Ravi *et al.* 2013; Hadidi *et al.* 2014). The time we gain through the use of touch-screen input devices may mask deeper sacrifices in our cognitive engagement with our objects of inquiry.

Huggett's idea of digital distancing and Caraher's connection of digital platforms with de-skilling reflect observable changes in practice. In our project at Chersonesos, this was most evident in the perception of scale and relevance: instead of ignoring tiny pebbles that cannot be represented in a 1:20 pencil-drawn plan, team members digitizing context plans from orthorectified photographs in ArcGIS tended to zoom in to vectorize all of them, without making a conscious decision about whether it was actually useful to preserve the position of those pebbles (Rabinowitz *et al.* 2007: 251). The effects (or lack of effects) of new input mechanisms on our cognitive processes, however, are invisible to us unless we look for them. Since we cannot discuss cognitive changes on a practical or theoretical level until we have actually investigated them, our reflective manifesto should spur us to do so. This is all the more true because we are the consumers, not the creators, of these new mechanisms, and thus we lack the benefit of insights acquired during the design and user-testing process that produced the digital tools we are adopting.

The Cautionary Manifesto

This brings us to the third and last of our manifestos. A recent post by @flyingzumwalt on medium.com charged, with polemical eloquence, that the Internet has been coopted by for-profit ventures that seek to

control and contain the digital networks of human interaction that increasingly dominate it, and harvest the data that emerge from those interactions in order to turn them into money.[13] The author argues that the "cloud" is not a liberating development but the logical outgrowth of this theft, and that allowing corporations to preserve, manage, and monetize our social-media data is a fundamental act of alienation. As an alternative, a decentralized system based on peer-to-peer transactions between local databases is proposed, so that each user becomes the absolute owner of all of his or her social-media data. The organizing metaphor for this system is *swadeshi*, a Sanskrit term used to mean something like "self-sufficiency" and a fundamental tenet of the Indian independence movement and its resistance to British imperialism.

With a few substitutions—for example, swap "labor" for "data"—the parallels of @flyingzumwalt's essay with the Marxist critique of industrial capitalism become obvious. Those who control the digital means of production—that is, the software, the servers, the platforms, and the apps—are in a position to exploit the information generated by the online "work" of users and consumers. Kansa discusses similar trends in his chapter in this volume (Ch. 4.2), with a cautionary emphasis on the degree to which digital archaeology is dependent not only on commercial infrastructures (like the current version of the Internet), but also on commercial metaphors for value, in which branding becomes central and salesmanship can be more important than content. In addressing the tension between the open-data movement and what he sees as a "neoliberal" approach to digital archaeological information, he highlights the potential of more accessible data to change archaeological discourses. At the same time, however, he acknowledges the potential for exploitation that lies in the universal opening of data, and proposes, building on Caraher's "slow archaeology", a "slow data" approach that respects the human and ethical dimensions of the production of archaeological knowledge, rather than simply seeking to aggregate, homogenize, and centralize all archaeological data as efficiently as possible.

Kansa, as the director of a non-profit organization, knows all too well the feedback loop between grant funding and the perception

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[13] "The internet has been stolen from you. Take it back, nonviolently": https://medium.com/@flyingzumwalt/the-internet-has-been-stolen-from-you-take-it-back-nonviolently-248f8d445b87#.nmje0lqvw.

of innovation, and his contribution pays explicit attention to the economic framework within which our digital work takes place—a framework that, like @flyingzumwalt's Internet, we do not own. His chapter is a fitting conclusion to the second half of this volume: if the first two sections are about the time we save in the field, the second two are an unmistakable reminder that time is money. All of the chapters in Parts 3 and 4 struggle, from a variety of perspectives, with the relationship between the intellectual quest for archaeological knowledge and the role of money in that quest. And while the goals of the projects represented in Part 3 are diverse, ranging from the development and application of customized data-collection tools (Castro López *et al*., Ch. 3.1) to the profitable management of a large commercial cultural resource management (CRM) company (Spigelman *et al*., Ch. 3.4), they all acknowledge the central role of capital in digital approaches to archaeology. Economic capital in the form of equipment, from cameras to servers; economic capital in the form of seed funding for the development of digital infrastructure from governmental or private sources; social and economic capital in the form of access to knowledge workers—all of these must be available for the sort of work described in this volume. And social and economic capital is unevenly distributed. How, then, can we keep digital archaeology from becoming an archaeology of privilege, an archaeology of exclusion, an archaeology of winners and losers?

Western archaeology has, of course, traditionally been all of those things. Colonialist states funded archaeologists (usually men of the upper classes) to uncover the past of lesser nations, and those privileged archaeologists embedded relations of class and power in their fieldwork, especially with respect to local workers, whose contribution was understood as purely mechanical. Leonard Woolley, for example, paid workmen by the find while digging at Ur between 1922 and 1934, translating to the excavation site the piecework logic of the industrialized West. And the archaeological community has always picked winners: nowhere is this more apparent than in the poignant image of Frank Calvert paddling out, in the winter of 1863, to the boat on which the director of the British Museum was traveling through the Dardanelles in order to solicit him for support to excavate at Troy, only to be sent away because the director was sleeping (Allen 1999: 98). Schliemann, the eventual winner, appeared on the scene to claim the glory seven years later. If we look at the economic framework within which

Schliemann and Woolley operated, however, there are some striking differences with our current situation. Schliemann was able to self-finance, having to pay only for workmen, tools, lodging, and his paper and pens while in the field. Woolley's field expenses, too, were largely associated with the payment of workmen and logistical costs for the staff.[14]

The extensive use of digital technology in archaeological projects, on the other hand, requires significant initial expenditures for equipment, software, and technical consultation, and then the ongoing costs related to the sustainability of both data and platforms. None of these come cheap unless the archaeologist directing the project or one of the senior staff is also a competent software developer and comfortable working with open-source code. A new Schliemann could fund all of this himself, but most of us have to compete for a dwindling pool of public money. As Kansa (Ch. 4.2) points out, this encourages winner-take-all efforts to brand our systems, to offer *the* solution, to emphasize our innovative approaches—and to continue to raise the bar in each round of grant-writing, promising newer and better and different tools and methods. In short, digital archaeological projects are encouraged to act as Silicon Valley start-ups in a Darwinian landscape in which the most innovative and disruptive players are the ones that deserve to survive. The market—in this case, which is composed not only of CRM clients but of sources of public funding—will decide. There is much less room for smaller players in this environment, especially as start-up costs rise and investors concentrate on proven performers.

The cautionary component of a manifesto for a critical digital archaeology must focus on this economic model. Left unchecked, it will push us toward an emphasis on form over function, on tools over knowledge, on the technological solutionism discussed by Kansa. Moreover, beyond our own funding struggles, we must recognize that the same factors are playing out in the broader field of digital technology, and that the way they play out will have a direct effect on the practice of archaeology. Away from bugs, humidity, and fire or flood, a notebook can sit on a shelf for a century and still be consulted. But computer hardware and software are intended to change constantly

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[14] It is instructive to consult Woolley's account statements for 1926 to 1933 on the crowdsourcing website of the Ur Digitization project; e.g., http://urcrowdsource.org/omeka/files/original/4bc43d8e9ad6beb8973dfaba02ed2623.jpg.

to compel users to purchase new versions, and digital technology companies are rewarded for disruptive innovations that kill other platforms. For hardware, this means constant updates that make relatively recent iterations obsolete—and companies like Apple drop in valuation when they are not inducing everyone to buy new products quickly enough. At the same time, for software and digital content, a rental model is increasingly replacing ownership: where once one bought a personal copy of Adobe Creative Suite (and then could choose whether to buy updates), Adobe is now pushing users to rent the continuously updated Creative Cloud on a monthly or yearly basis. Libraries purchase access to e-books that can lapse or be revoked by the publisher, at which point the books simply disappear from the virtual shelves. Providers of software and hardware, like the providers of commercial social-media platforms decried by @flyingzumwalt, benefit by locking in customers and creating dependency.

This volume demonstrates the dependency of digital archaeology, and especially of mobile recording systems, on a constellation of hardware and software technologies that are owned by groups with different priorities. In the best cases—with projects like FAIMS (Federated Archaeological Information Management System) or ARK or Open Context—those owners, themselves archaeologists, share the disciplinary mission of archaeology. But they also have to pay their operating costs, even as the directors of field projects are focused on minimizing their own. In the more troubling cases, the owners of the technologies are corporations focused on maximizing shareholder profit, which may mean changing terms of service, discontinuing products, or creating entirely new platforms. The innovation cycle creates possibilities—10 years ago, before Apple's touch devices, this volume would have been inconceivable—but it also creates significant challenges for a discipline that is by nature concerned with the *longue durée*. We have to think carefully about the impact that changes in the tech industry can have on the systems we are developing, if only to explore the worst-case scenarios. How would we react if Apple, which now owns FileMaker, decides to discontinue it and build a new mobile operating system with which the old versions are incompatible? What effect would it have on archaeological workflows if AgiSoft were to end educational pricing for its PhotoScan photogrammetry software and switch to a yearly-fee licensing scheme at industry costs? Which changes to our hardware and software ecosystems would merely

set us back, and which would cripple us? What impact would these changes have on our local collaborators, who in many cases lack the digital infrastructure and economic resources to benefit from these technologies in the first place?

I do not think it is possible, at this point, to embrace the radical self-sufficiency of a *swadeshi* movement in digital archaeology; even if we could all acquire cheap, programmable devices, programming skills are not equally distributed. But this cautionary manifesto should encourage us to keep in mind the socioeconomic factors that condition our use of digital tools, and the fundamental relationships of inequality and dependency that they create. This is all the more critical given the first two manifestos: the excitement of the celebratory manifesto can be blinding, while the reflective manifesto reminds us that we may not fully recognize the changes in ourselves that are being generated by our entanglement with digital technology.

Agency, Entanglement, and Transhuman Archaeology

Early in this response, I compared the transformations wrought by digital recording systems in archaeology to the invention of the ground-glass lens or the introduction of the printing press. Like the ground-glass lens, which expanded our perception to include very tiny and very distant things, digital tools allow us to change the scale of our observations from the human to the micro- or macroscopic, from submillimeter surface geometry to multispectral satellite images. And like the printing press, digital publication platforms and the Internet have made it possible to disseminate data widely and cheaply, democratizing access to information. Yet neither the printing press nor the microscope and telescope were meant to capture and reproduce reality in its entirety; the information they gathered or spread was always filtered by human agency, and according to individual agendas. We should remember that the same is true of digital documentation, despite claims about its objectivity, comprehensiveness, and capacity to act as a lossless surrogate for the physical world.

Furthermore, while ground-glass lenses led to new scientific discoveries, and while the products of the printing press transformed the reading habits of literate Europeans, neither microscopes and telescopes nor movable type and screw-presses became entangled in everyday life to the extent of digital tools. Here a better parallel may

be Filippo Marinetti's roaring, smoke-belching, beautiful speeding automobile. Cars made it faster to get from an arbitrary point A to an arbitrary point B, improving on previous modes of transportation like the horse or the railroad. But when mass-produced on the assembly line, they also transformed culture and social life, changing our sense of speed, providing new modes of status display, and affecting our health, our foodways, and the spatial organization of our cities—not always for the better. Cars had agency even before they started to drive themselves, and we are only now, after a hundred years, realizing how durable and pervasive their influence is. Similarly, while the role of human agency in digital documentation should not be neglected, neither should the agency of the digital tools themselves. We usually ask only what new affordances digital tools offer, but a critical digital archaeology should also ask what affordances of the physical notebook are lost to the rise of the mobile device.

Not only do we need to actively theorize our tool use, we need to think carefully about the human dimensions of the management of the digital data we produce. If we seek to capture an exhaustive record of the reality of our object of inquiry, what are we going to do with that record? The digital revolution surpasses that of the printing press or the chemical photograph both in the quantity of information it is generating and in its inherent ability to create connections between different pieces of data. As Sobotkova and colleagues (Ch. 3.2) point out, "only after digital datasets are published and researchers start reusing and combining them will the full potential and impact of digital methods be realized." Why, then, have we been so slow to seek new knowledge through the reuse and combination of disparate datasets? There have been numerous steps in this direction, from the establishment of the "Recycle Award" at the Computer Applications and Quantitative Methods in Archaeology conference to the increasing application of Linked Open Data principles to archaeological datasets, but results have been slow to appear. A group of archaeozoologists have produced a scientific publication by aggregating data stored within Open Context (Arbuckle *et al*. 2014), but this seems rather the exception than the rule. Paperless recording systems and richer digital datasets have not yet spurred the sort of syntheses that this shift promised, and a critical digital archaeology would do well to investigate the possible explanations for this lag. The technical barriers to data sharing and integration are increasingly

surmountable, which suggests that the absence of integrative work has more to do with culture than with technology.

One last area in which paperless recording systems in general, and the use of mobile devices in particular, can play an essential role in a critical digital archaeology involves "transhumanism," or the notion held by a new generation of Futurists that technology is being integrated with the human mind and body in ways that will enhance our abilities, perceptions, and lifespans beyond their biological limits (More and Vita-More 2013). In this context, it is not the idea of enhancement that I would like to emphasize, but the integration, into our bodies, lives, and work, of machines that document *us*. Database changelogs already record who made what emendation to a record, and even word-processing programs can track when, by whom, and for how long a document was opened. Mobile devices add the ability to record an individual's position in space, and personal fitness accessories can track heart-rate, caloric intake, or aerobic activity. Add computer-vision platforms that can identify visual trends in photographs taken by a particular photographer and natural-language-processing algorithms that can assess a writer's changing emotional state from a series of context descriptions, and we already have the means to create an independent, multidimensional picture of an individual's digital archaeological practice. Such rich documentation of the archaeologists themselves could bring us closer to more empirical measures of reliability and reproducibility in digital archaeological research.

In some ways, this is the realization of Hodder's vision: since he began work at Çatalhöyük in the 1990s, he and his team have experimented with documenting themselves documenting the excavation. This self-examination has taken forms ranging from personal observations in site diaries that were then published as part of the dataset, to the employment of videographers and cultural anthropologists to record the archaeologists at work.[15] Imagine, then, a similar project that could capture an independent digital record of every act of docu-

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[15] For the former, see this 1999 entry by Ruth Tringham: http://www.catalhoyuk. com/database/catal/diaryrecord.asp?id=387. For a holistic presentation of the documentation of the archaeologists who worked on the University of California at Berkeley (BACH) team associated with Hodder's long-term project at Çatalhöyük, see Tringham and Stevanović 2012 and http://lasthouseonthe-hill.org/.

mentation—not only edits and emendations, but the state of mind of the writer, the confidence of her hand as she sketches on a photograph, and even her timestamped track through space for each day in the field.

This is also, of course, the realization of Frederick Taylor's vision, with its focus on the scientific management of human machines through quantification—and of Michel Foucault's nightmare of constant, ubiquitous surveillance (1979: 195-228.). The same tools that free us to collect more comprehensive documentation about both archaeological remains and the process of archaeological excavation also bring potential threats to the privacy, autonomy, and dignity of the researchers. As our devices collect more and more data about us, we will have to address a new set of questions about power and control that underline the need for a political sensibility in critical digital archaeology. Who decides what information about the archaeologists will be captured? What sort of mechanisms for consent should be set in place? Who has access to the information, and what role does it play in the project archive? Do participants who, in the future, decide they no longer want to appear in the documentation have a right to be forgotten?

The last question is very much of the moment, as right now Western culture is preoccupied with the idea that all of our past transgressions will remain on public display on the Internet forever. But this impression obscures the fundamental fragility of digital data, and the final word of our manifesto must touch on preservation. It is our moral imperative as archaeologists to ensure that the documentation of our research is not forgotten, and the more novel and proprietary the media we use to record and store that documentation become, the more obligated we are to develop strategies to ensure that our information is not dependent on a particular platform for its survival. We should work toward a paperless archive that will still be accessible, at least on a minimal level, a hundred years from now, just as the paper archives of our predecessors of a century ago can (in most cases) still be consulted. We must mobilize ourselves for a critical digital archaeology that will not seek only to save time or capture it, but that will place our work at this particular point in time's stream and send it—sealed, caulked, and labeled—downriver toward the future.

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https://mobilizingthepast.mukurtu.net/collection/52-response-mobilizing-ourselves-critical-digital-archaeology

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