MOBILIZING *the* PAST *for a* DIGITAL FUTURE

The Potential of Digital Archaeology

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

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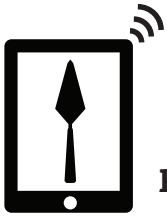
Table of Contents



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).

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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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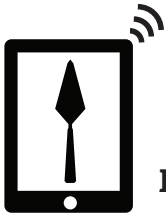

How To Use This Book

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

4.1.
Slow Archaeology: Technology, Efficiency, and Archaeological Work

William Caraher

Slow archaeology is a concept that I developed to offer a counterweight to recent trends in archaeology that emphasizing digital tools as a way to improve efficiency in fieldwork. Drawing on recent academic and popular criticism of the increasing speed of capital, technology, and daily life, slow archaeology similarly calls attention to the negative impacts of the accelerated pace of archaeological work made possible by digital tools. Awareness of efficiency and speed in fieldwork, of course, is not new, but has roots both in the long-term development of industrial practices within archaeology as a discipline and in scientific practices that alternately disclose and occlude elements of knowledge production. Bruno Latour's concept of the "black box" is useful to understand how certain efficiencies achieved by digital tools create, reinforce, or obscure archaeological practice and methodology (Latour 1987: 1-21). For Latour, black boxes hide certain processes or maneuvers either owing to their complexity, their routine character, or their location outside of the expertise of disciplinary work (Latour 1987: 2-3). The contribution explores certain aspects of digital innovation in archaeological field practices and methodology and argues that the discipline would benefit from considering some of the critiques offered by proponents of the slow movement.

My idea for a slow archaeology draws upon the scholarly criticism of speed that is most frequently associated with larger critiques of modern capitalism. For David Harvey, for example, the speed of capital in contemporary society has outstripped human conceptions of time and space and has led to "the annihilation of space by time" through "time-space compression" (1990: 260–307). Marc Augé (1995)

recognized the speed of the contemporary world as a significant contributor to the serialized production of non-places that exchange the distinguishing characteristic of place for the efficiency of legibility. Paul Virilio, in his concept of dromology, has stressed the transformative aspects of speed and, perhaps more importantly, acceleration in modern society. Beginning with the industrial revolution, the drive to make things and processes faster, more efficient, and more connected has become an end unto itself. For Virilio, speed produces a distinct realm of experience and knowledge (Virilio 1986; see also James 2007: 31–32). A traveler in a car both experiences and produces the landscape in a way that is distinct from the experience of the landscape on foot (Virilio 2005). Hartmut Rosa (2013: 1–32), following Virilio and Augé, argues that the rapidly shrinking present has created a kind of fluid, unstable, and unfamiliar world.

Popular media has explored the critique of speed through concepts like "slow food," which celebrates the deliberate preparation of locally sourced food as a challenge to the homogenized and generic fast food experience. Initially championed by the Italian activist Carlo Petrini (2003), the idea of slow food offered another way to critique the speed of contemporary life. Carl Honoré (2004) and others have extended Petrini's idea of slow food to a wide-ranging critique of the cult of speed in the modern world. These writers, however, have endured criticism especially from those who see the opportunities to slow down as only possible because of prosperity only available to the privileged and provided by the inhuman efficiency of the industrial world (see, for example, Sassatelli and Davolio 2010 and Andrews 2008: 165-182). Despite these critiques, these authors have offered practical advice on how to slow down individual engagements with the world. Petrini, for example, celebrates local food ways, while Honoré advises that we set aside time to unplug and savor the pleasures of experience without interruption or mediation. Absent the distractions of technology, the local environment takes on greater significance and vividness.

Slow archaeology calls upon archaeologists to recognize the influence of speed on archaeological practice. This chapter will not ask archaeologists to discard their digital tools or reject the remarkable benefits of technology in the name of a romanticized past. Rather, I will offer a critique of certain digital practices and, perhaps more importantly, the way in which these tools are described and promoted in the scholarly discourse. I remain skeptical that archaeology will benefit

from tools that offer greater efficiency, consistency, and accuracy alone, and my hope is that this skepticism has particular significance at a time when a new generation of digital tools are entering the field.

Unpacking the implications of our use of digital tools and the adoption of streamlined practices require some attention to the intersection of scientific and industrial practices in archaeology. The recent growth of contract, salvage, and rescue archaeology has made the influence of speed and capital on archaeological work particularly visible. The pressures of development and the efficient management of heritage as a resource have provided ample reason for the enthusiastic adoption of digital tools and practices. Among academic archaeologists, shrinking resources, the pressure to "publish or perish," increasingly intensive field methods, and the expectations of host countries have likewise put pressure on the pace of fieldwork. The goal of slow archaeology is to recognize the particular emphasis on efficiency, economy, and standardization in digital practices within the larger history of scientific and industrial knowledge production in archaeology. This contribution also seeks to carve out space within the proliferating conversation about digital archaeology to identify practices and tools that embrace the complexity of archaeological landscapes, trenches, and objects. In this way, slow archaeology recognizes that archaeological presentation and publication tends to simplify the impact of technologies and the often-messy relationship between evidence and argument. The concern for data as both publication and evidence finds common cause with Eric Kansa's recent interest in "slow data," which embraces the dynamic and profoundly human character of archaeological datasets as an element of added value rather than distracting complexity (see Kansa, Ch. 4.2).

My position as a tenured, academic archaeologist provides a distinct professional context for slow archaeology. My efforts to develop slow archaeology come from a position of privilege. As an academic archaeologist, I rely on his research for professional advancement, but not professional survival. Tenure provides opportunities for a more deliberate pace toward publication. Academic projects also tend to align research goals closely with the personnel, time, and funding. These luxuries have allowed us to consider a wide range of archaeological documentation processes without particular concern for efficiency. We have deployed a range of digital tools and practices from the use of iPads (Caraher *et al.* 2013) and structure-from-motion (SfM) 3D

imaging (see Olson, Ch. 2.2) to now standard reliance on differential GPS units, relational databases, and geographic information systems (GIS). This article then is not the frustrated expressions of a Luddite outsider, but an argument grounded in a familiarity with digital field practices.

The Industry of Disciplinary Knowledge Production

Latour has argued that in the history of science, there arose a division between nature, which was the object of scientific inquiry, and culture, which provided the tools and language for understanding the relationship between these observations (Latour 1993). This division between nature and culture encouraged the development of processes that emphasized data collection (from nature) as distinct from interpretation and analysis (as culture). Moreover, it also influenced how scholars present the production of knowledge and how they separated the process of collecting observations from the analyzing and organizing these observations (Latour 1993; Martin 2013: 69–70). Latour studied practice as a way to critique the division between nature and culture, and he argued that science produces knowledge not through simple observation, but as a result of a dense network of entities and actions that range from funding agencies, governments, fellow scientists, institutional priorities, and innumerable small decisions made on the basis of assumptions about how nature works. For Latour, the inseparability of nature and culture at the level of scientific practice is distinct from the representation of research in publications. The former embodies a network of relationships between human and nonhuman, animate and inanimate, institutional and individual, whereas the latter represents the data as independent realities that support scientific arguments. In archaeology, this distinction manifests itself in a division between "raw data" in archaeology (Gitelman and Jackson 2013)—often presented in scientifically structured catalogues—and the narrative or expository historical arguments. Awareness of this division has provoked recent discussions of digital data collection strategies that stop short of demonstrating how these changes produce new arguments or understandings of the past.

The use of technology in archaeology is not new, and, in fact, it has deep roots in the complicated intersection of the discipline, science, and industrial practice from the field's 19th-century origins. Heinrich

Schliemann, for example, funded his work at Troy and Mycenae through his former life as an industrialist and brought industrial organization to his excavations. Mortimer Wheeler and August Pitt-Rivers both drew upon both their military backgrounds and industrial practice by employing relatively unskilled workmen to excavate while leaving the interpretative responsibilities to their more discerning eye (Lucas 2001: 8). As Berggren and Hodder (2003: 422) have noted, the workers were "replaceable tools in the machinery." Such hierarchical organization of the archaeological workforce persists today. In cultural resource management (CRM) practice, "field technicians" represent a subordinate group to the archaeologists who supervise and interpret the results of excavation for official reports (Lucas 2001: 11–12). Many academic excavations have clear divisions between the inexperienced excavators, who are often students, and the more experienced trench supervisors. This coincides with the practice of separating the manual work of excavating from the "more intellectual" work of recording and documenting, although it is worth noting that many excavations recognize the tremendous value of local workers who are deeply familiar with local conditions. In general, the organization of archaeological projects reinforces a division between data collection and interpretation and analysis.

The division between data collection and its interpretation located practices separated the work of removing earth, counting objects, and describing contexts from the work of analyzing and, ultimately, publishing, archaeological conclusions. This made data collection susceptible to efforts that would both increase efficiency and improve the quality of data collected. Nowhere are these practices more visible than in CRM (see Spigelman *et al.*, Ch. 3.4), where streamlined data collection methods certify that the recording of archaeological information keeps pace with development and are efficient enough to ensure that the firms involved remain solvent. Various contributors to the British CRM industry, in particular, have developed streamlined recording sheets (and attendant practices) that ensure that data is recorded in a standardized way according to best practices (Pavel 2010: 16–17). As Catalan Pavel has pointed out, the practice of documenting archaeological sites carefully is closely tied to the official "preservation by record" policies of the British government—policies that rest on the assumption that an archaeologist might be able

to reconstruct the site after its destruction from the record collected during the rescue excavation process.

The rise in CRM archaeology has made the links between archaeological practice and the pressures and pace of capitalism more explicit, and it has amplified a tendency toward industrial practices present in academic contexts as well. Academic archaeology developed as a professional discipline alongside the emergence of industrialized academic disciplines in the modern university (Menand 2010) as well as emerging museums (Dyson 2006: 133–171). This shared trajectory reinforced the industrial organization of archaeological knowledge production. In a disciplinary context, industrial practice and professional archaeology are inseparable both chronologically and institutionally. The university developed systematic ways to educate young adults with courses arranged across disciplines to build key skills, provide professional credentials, and produce productive contributors to American society (Novick 1988; Menand 2010). While variation existed across universities, over the course of the late 19th and early 20th century, many oriented their curriculum toward the challenge of providing credentials for the growing body of professionals required by industry and our increasingly specialized society. This desire for specialization found its most extreme manifestation in the logic of the assembly line, which assigned individuals to perform single, exceedingly limited tasks over and over. Through coordinating the hyper-specialized actions of dozens of individuals, the assembly line produced a single product as efficiently as possible. Higher education employed a similar approach to producing educated individuals by dividing up the process of education among various specialized experts in particular disciplines.

Historically, these industrial influences on higher education have incurred resistance, although much of resistance is not articulated as such. Disciplines like history, art history, literature, anthropology, and archaeology have periodically used the word "craft" to describe their undertakings (e.g., Bloch 1953; Frisch 1990), but this perspective was rarely positioned explicitly as a countercurrent to industrial models of education and knowledge production (Maguire and Shanks 1996; Taylor 1998). Recently there has emerged a more consistent resistance to the "audit culture" surrounding university education, and this has pushed cultural anthropologists to emphasize the holistic, embodied, and immersive experience of fieldwork (Herzfeld 2007). Scholars of

art and literature historians have championed the open-ended and contemplative process of close reading, or the patient, unhurried examination of a work of art (Roberts 2013). All these approaches to disciplinary knowledge have a few elements in common. They resist the fragmentation of tasks common to industrial practices and ground disciplinary knowledge in the willingness to embrace the slow process of experience. As a result, these disciplines generally have ignored calls for efficiency and embraced practices and knowledge derived from careful examining, close reading, and contemplation.

Archaeologists have looked beyond contemporary practice to emphasize the foundation of their discipline's craft practices. Michael Shanks and Matthew Johnson, for example, have explored the origins of archaeology in 18th-century traditions of historical perambulations, landscape painting, and literature (Johnson 2006; Shanks 2012). The historical English countryside came alive not through the systematic treatments by specialist scholars, but through contemplative encounters mediated through art and literature. These pre-industrial approaches to the landscape cast a long shadow across the discipline and served as a counterweight to the influence grounded in industrial practices. While the 18th- and 19th-century rural wanderers were members of the economic and social elite seeking to inscribe their aristocratic vision on a landscape as a counterweight to industrialized wealth, craft continued to embody non-aristocratic approaches to knowledge as well. Despite the historical awareness of pre-professional practices in archaeology (and other disciplines), Shanks and Marxist archaeologist Randall Maguire considered the impact of craft to be "latent" in the field of archaeology and primarily manifest in the creativity of the archaeologist's work where "hand, heart, and mind are combined" (Maguire and Shanks 1996: 82).

As Mary Leighton's recent article (2015) has emphasized, the tension between craft elements in archaeological practice and the ordered routine of industrial production varies widely across the discipline. In her important study, she compares Andean archaeological practice to the CRM practices pioneered by the Winchester Research Unit in the United Kingdom (for the Winchester Research Unit model, see Pavel 2010: 27–28, 44–45). The Andean project had largely unskilled, local workmen supervised by graduate students who maintained paperwork and was overseen by project directors who coordinated the efforts of field teams, the orderly flow of artifacts, and the collection

of completed forms. In the practices of the United Kingdom project, open-area, single-context excavations placed the excavator trench-side "with both a pen and a trowel" (Leighton 2015: 81) and focused on the production of single-context forms. Both projects concluded with the creation of Harris matrices to describe the archaeological contexts present in an area. Leighton observes that despite the similarities of the output of these projects, significant variation exists in archaeological practice. In the Mediterranean, for example, the hybrid system employed by Corinth Excavations demonstrates how highly skilled local workers can lead inexperienced graduate student "supervisors" through the complexities of single-context excavation (Pavel 2010: 90-92). In other words, the systematic organization of archaeological labor occludes a range of trench-side practices that preserve the "latent" impact of craft practices beneath layers of scientific management.

Process and Practice

The tension between practice, archaeological method and methodology, and publication is the space where slow archaeology and craft meet the industrial demand for efficiency and speed. For archaeology, stratigraphic excavation embodies certain aspects of industrial practice and modes of organization by parsing complex situations into more granular entities (McAnany and Hodder 2009; Leighton 2015). The identification and removal of discrete levels and the systematic arrangement of these strata in relation to one another structures the archaeological record in a way that allows for chronological and spatial descriptions of past depositional events. The work of dividing the excavated world into distinct strata paralleled the use of fragmentation as a tool of efficiency in industrial practice. Working from strata to strata across a trench, stratigraphic excavation defined the complexity of time and space through distinct slices. Each stratum received careful documentation in notebooks including textual descriptions, illustration, and photography (with the spread of affordable photographs, see Bohrer 2011).

Some scholars have recognized Latour's "blackboxing" in the process of stratigraphic excavation (Latour 1987; Mickel 2015). The widespread use of Harris matrices to reduce stratigraphic levels into uniform boxes further supports this observation since these matrices

create uniform divisions or contexts for artifacts later studied by specialists (Harris 1979). The artifacts and relationships often help to assign either relative or, in a best-case scenario, absolute dates to each level, to associate a function with the space, or to define particular archaeological events. As the discipline of archaeology and methods of excavation have become more complex, a larger number of specialists are relied upon to assist in identifying and analyzing the material present. The largest projects now rely on dozens of specialists who work in parallel with excavators, wheel-barrow drivers, trench supervisors, area supervisors, field directors to produce archaeological knowledge. Both the assumptions surrounding archaeological practice and the specialists who contribute to it encourage the maintenance of industrial discipline to ensure that the fragmented data sets might be re-integrated at a later point. As Leighton points out, however, the implementation of this kind of industrial order comes at the level of practice. For her, blackboxing defines both the processes of archaeology and the way that the product of these processes hides variations in practice (Leighton 2015).

The New Archaeology of the second half of the 20th century contributed to the interest in processes that fragmented archaeological information recovered during fieldwork. The interest in quantitative analysis and studies that relied upon the precise plotting of sites across a region or artifacts within a site required the identification and sometimes isolation of discrete objects (Lucas 2001: 126–127; Thomas 2004: 76–77). New Archaeologists were confident that collecting data from the field systematically was the central concern for fieldwork, and the understanding of this data through hypothesis testing and theory building was a secondary process that often occurred in a separate place (Witmore 2004). Regional, intensive pedestrian survey adopted the techniques of New Archaeology to construct palimpsests of overlapping maps produced by a range of specialists and, ultimately, computer-generated algorithms (e.g., Gillings *et al.* 2000; Alcock and Cherry 2004). The maps derived from rigorous fieldwork and laboratory analysis allowed archaeologists to visualize artifact scatters, sites, and settlements across richly detailed regional scales. Over the past decade, methodological debates in Mediterranean archaeology and a growing interest in behavioral archaeology and formation processes have increased the intensity of artifact collection and the complexity of the resulting maps, but the basic structure of field practices and

analysis remain unchanged (e.g., Bevan and Conolly 2013; Caraher *et al*. 2014).

The development of systematic practices in intensive survey paralleled the spread of Harris matrices in excavations. This practice reflected the growing interest in documenting vertical spatial relationships and depositional contexts in a way that regularized the units of archaeological interpretation. The tidy character of the Harris matrices presents stratigraphic deposits in a formal and generalized way that allowed them to be compared over open-area, single-context excavations while preserving the autonomy of individual excavators (Leighton 2015). In other words, Harris matrices represent the product of trench-side interpretation that forms the basis for understanding the archaeological structure of the site.

Digital Tools and Practices

The intersection of science and industrial practices in archaeology resulted in archaeological methods based on standardized procedures linked directly to the production of consistent and regular results. As Leighton notes, however, formal descriptions of archaeological processes obscure messy archaeological practices and complex data sets to facilitate analysis. It is important to recognize that some normalization of archaeological results is necessary to communicate complex situations, idiosyncratic environments, and dynamic social and political relationships present in any archaeological process. Christopher Witmore and others have identified mediation as a key element in archaeological work (González-Ruibal 2008; Witmore 2009). At the same time, these processes that archaeologists use to produce consistent data are under pressure both from within the academy and from the cultural resource management industry. A new crop of digital tools has entered into this situation with promises to reinforce and accelerate longstanding tendencies in archaeological knowledge making. Slow archaeology challenges archaeologists to consider how this acceleration has led to the transformation of the discipline.

Archaeologists have largely seen the adoption of digital tools as a way to improve efficiency (Olson *et al*. 2014; Roosevelt *et al*. 2015; Wilhelmson and Dell'Unto 2015; see also Spigelman *et al*., Ch. 3.4; Wallrodt, Ch. 1.1). By doing things faster without losing accuracy

or precision, archaeological projects can collect more information, which is typically encoded as bits of data that allows them to reconstruct archaeological contexts more completely in less time. Digital tools have reinforced tactics used by archaeologists to standardize their practices and continued trends in producing discrete bits of data useful for the kinds of studies developed in New Archaeology. As Pavel has argued, these archaeological methodologies manifest themselves in the slow replacement of trench diaries or notebooks with detailed forms that became widely used in the last decades of the 20th century (Pavel 2010). While most forms preserve space for interpretation and analysis at trench-side, the dominant trend has been toward more atomized recording designed to improve accuracy in the field, to normalize description for comparison or seriation across a site, and to facilitate quantitative analysis.

Today's use of iPads or other tablet computers at trench-side or in the field reproduce many aspects of paper forms while enforcing additional regularity in recording. The use of iPads by Steven Ellis's Pompeii Archaeological Research Project Porta Stabia crystalized the potential of tablet computers to streamline trench-side data collection (Pettegrew *et al.* 2013; see also Ellis, Ch. 1.2; Fee, Ch. 2.1; Poehler, Ch. 1.7; Wallrodt, Ch. 1.1). The best-designed applications, like those used by Ellis's and Poehler's teams at Pompeii and similar databases described by other authors in this volume, include a combination of dropdown menus and open text fields to encourage trench supervisors to be both consistent and detailed (Dufton, Ch. 3.3; Motz, Ch. 1.3; Spigelman *et al.*, Ch. 3.4). Moreover, these databases make it possible to track changes to entries through time, thus allowing project directors to observe how trench supervisors adjusted their data throughout the excavation process. The data recorded at trench-side eventually becomes part of the larger project database and is made available on devices throughout the project. In short, the data collection process becomes more straightforward, consistent, transparent, and efficient.

In addition to neatly delineated recording forms and the digital versions replacing the more free-form notebooks, 3D "structure-from-motion" photography offers a method to further streamline trench and artifact illustration (Olson *et al.* 2014; Roosevelt *et al.* 2015; Olson, Ch. 2.2). By documenting a trench as a series of individual photographs, software like AgiSoft PhotoScan can produce an accurate 3D model of the trench. On a day-to-day basis, it is possible to use

these methods to document individual strata in a trench, or at least to capture the spatial arrangement of various important contexts at a much greater speed than traditional trench illustration. At the end of an excavation season, when time always seems at a premium, my project on Cyprus—the Pyla-Koutsopetria Archaeological Project—was able to use structure-from-motion images that reproduce overhead trench photographs without the inconvenience of erecting a scaffolding or hiring a lift to provide accurate overhead images of the entire trench. The time-saving possibilities and increases in efficiency are notable and real. At the same time, by working to automate a key component of archaeological documentation, archaeologists continue to marginalize practices that involve craft modes of production like illustration or the skilled work of the excavator (Perry 2015). Moreover, the emphasis on the efficiency of these practices runs the risk of undermining the specialized awareness that these practices have the potential to encourage (Morgan 2009, 2012; Perry 2015).

To achieve these efficiencies, standardized recording sheets, whether in paper or digital form, and structure-from-motion photography transform the archaeologist and archaeological information in similar ways. First, both techniques involve the archaeologist breaking the site into fragments. For recording sheets, this involves dutifully filling in a series of predetermined descriptive fields ranging from soil Munsell color to dimensions, elevations, and features. It is hardly surprising that survey projects that developed directly from the ideas expressed in New Archaeology relied on forms and digital recording from the start of the famed "second wave" surveys in Greece (Bintliff *et al.* 1999; Cherry 2003). Structure-from-motion photographs are likewise fragmented views of the trench that rely on computer algorithms to reconstruct their proper relationships.

The fragmented, if more comprehensive, records created by digital practices in archaeology almost always require reassembly after the archaeologist leaves the field. The longstanding focus on the systematic collection of data in the field has produced a body of information that requires reassembly according to traditional archaeological practice (Lucas 2001). As the information collected in the field has become more granular and more digital in character, the tools and techniques required to reassemble it have become more complex. The archaeologist is at the top of a system of excavators, surveyors, and specialists but also interacting with complex hardware and software applications

that range from "basic" Microsoft Access and FileMaker databases, to more complex applications like ArcGIS maps and 3D imaging suites, as well as other intermediary programs that allow for data to move between applications and devices. This software, as well as the hardware used to collect data at the trench-side or in the survey unit, function as parts of a larger digital ecosystem (for the use of the term "ecosystem" in the context of digital archaeology, see Forte *et al*. 2010; Kansa 2012). This ecosystem requires qualified personnel and additional levels of vigilance to maintain the system in which these bits of data make sense. Compared to the relative simplicity of an excavation notebook, which requires almost no particular technology to read and understand, the modern excavation or survey dataset is a virtually meaningless mass of encoded data.

Our dependence on technology to reconstruct archaeological contexts becomes even more acute when dealing with data produced by 3D-imaging technologies which rely on either bespoke or proprietary software to produce legible results. Even if we accept that the basic data behind 3D images, such as point clouds, are actually quite simple to decode and understand, and that it is possible to archive the photographs, point clouds, and even polygons from which a 3D model derives, the process of producing a 3D model and the 3D models itself are often the distinct product of proprietary software. Moreover, as the contributors to this volume demonstrate, our ability to produce 3D models has existed for quite some time, but these models remain difficult to publish outside a few academic publishers, and they remain challenging to preserve in a reproducible way (Opitz 2015; Reinhard 2015). These limitations do not diminish their potential utility, but they do reveal one side-effect of fragmenting our archaeological data in an effort to manipulate it in more efficient (and also more dynamic) ways. Without attention to the larger digital and social ecosystem in which they function, however, we run the risk of decontextualizing our archaeological processes.

Just as data collection strategies that privilege a more efficient, but fragmented, workflow have separated the work of excavating or field walking from the work of analysis, so too have an increasing reliance on digital tools—some of which are proprietary and many require specialized skill to manipulate—complicated the social organization of the interpretative process. Archaeologists must now approach critically the digital tools that we use and recognize our limited access to

the structure of these tools and the technologies and code that makes them work. While archaeologists have always relied to some extent on tools that they did not entirely control (after all, who knows how a Marshalltown trowel is really made), digital tools are particularly fraught because the interplay between proprietary software and hardware across a digital ecosystem produces a network of subordinate assumptions, but nevertheless shape the basic structure of our research.

Toward a Slow Archaeology

Slow archaeology calls for a critical appreciation of the accelerated pace that digital tools have brought to industrial practices in archaeology. New Archaeology fortified the longstanding industrial influences in archaeology through its emphasis on methodology and adoption of neatly organized forms that serve to standardize archaeological observation at the point of recording. While reflexive and ethnographic treatments of archaeological practices have demonstrated that standardized forms occlude variation in the execution of the well-defined methods (Mickel 2015), most recent publications focusing on digital tools and practices have done little to rectify this disjuncture (e.g., Roosevelt *et al.* 2015), outside a few high profile examples (Berggren *et al.* 2015). As a result, the adoption of digital tools is particularly fraught because they tend to reinforce a methodological discourse that itself already represents a Latourian "black box." If methodology risks obscuring the range of actual practice, many digital tools actually celebrate their reliance on obscured complexity by presenting technology "that just works."

Slow archaeology also contends that the change in pace promised by digital practices is not simply the continuation of a trend toward greater efficiency in the field, but represents a substantive change in how archaeologists realize this efficiency and speed. The tendency of these new tools to produce "black box" solutions to problems of efficiency reflects the growing pressures on both academic archaeologists and those in the field of cultural resource management to produce results at the pace of development and capital. In other words, as digital tools accelerate the pace of archaeological work, more aspects of archaeological practice become obscured by technology.

In practice, slow archaeology encourages a more deliberate approach to archaeological fieldwork and to the adoption of digital technologies. To be clear, this does not require a rejection of digital tools or new techniques, but rather an adjustment in how we document the implementation of these tools in archaeological work. Allison Mickel's work on notebooks as a place for unstructured and reflexive recording demonstrates how preserving traditional recording alongside more standardized forms reproduces much of the same information in synthetic and narrative forms (Mickel 2015). While Mickel's study does not distinguish between digital and analogue practices—a field diary could be in paper or digital form and integrated into a larger digital ecosystem—the narrative diary nevertheless stands out as distinctly separate from field-recording practices associated exclusively with digital tools (Gordon *et al.*, Ch. 1.4). In the digital era, form-based recording of the kind documented by Pavel (2010) operates at the intersection of New Archaeology and digital practices geared toward efficiency. On the Western Argolid Regional Project, we asked team leaders to stop recording their detailed forms periodically throughout the day and to look across the landscape to understand the larger context for their work. Conversely, David Pettegrew (a team leader on the Eastern Korinthia Archaeological Survey) discovered that he had to return to the Corinthian landscape for several field seasons after he reassembled the data collected from the intensive survey in order to understand the neatly arranged maps from within the physical landscape of the isthmus. A narrative notebook or diary provides the opportunity for synthetic documentation of the fragmented data collected on a form, and it captures both the integrative experience of the landscape and recursive decision-making that shapes our encounter with excavated contexts.

The emphasis on digital tools for making archaeological work more efficient also transforms the character of archaeological practice. In earlier drafts of this paper and elsewhere, I used the term "de-skilling" to characterize the change in practices brought about by "black box" technologies in the field (Caraher 2013). For example, the basic skill of illustrating a trench is a proficiency that some archaeologists have suggested can be replaced by more efficient 3D-imaging technology. In place of the craft of illustrating, these technologies offer the digital skill of preparing a 3D image (Roosevelt *et al.* 2015). The main difference, however, is that in traditional practice, illustrating the trench

involves interpreting the representation of relationships between objects and resolving the myriad of small relational conflicts between the features visible in the trench. The goal of producing a dynamic 3D image, in contrast, is to gather as much information as accurately as possible. While the final illustration almost certainly obscures the decision-making process, it does capture the data points and features that the archaeologist considers crucial for their conclusions. In other words, illustration is the product of an explicitly interpretive process, and it reinforces careful observation and decision-making while excavating. 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 of the features in a trench and of 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.

Finally, slow archaeology, like the slow food movement, emphasize on the local and argues that the distributive tendencies of digital practices transform the place of archaeological knowledge production as well as the methods. To return to the example of 3D imaging, traditional trench illustrations locate archaeological argument-making at the edge of the trowel. In contrast, the use of a digital camera and software to produce a representation of the trench involves the passive collection of images at trench-side for later processing and study. The digital process shifts the illustration of the trench to the lab, computer room, or office. The illustration is based not on a physical encounter with the relationships visible in the trench, but on the series of photographs. Intensive pedestrian survey has likewise featured the almost mechanical collection of highly granular data from the field. This data relies upon remote processing to produce meaningful artifactual landscapes. There is no question that these remotely-created landscapes have added significantly to our understanding of the premodern countryside, but, at the same time, these digital maps risk being divorced from the physical encounter with the countryside. As fieldwork becomes increasingly associated with data collection and analysis, the space of interpretation shifts from the field to the office. The emphasis on place in archaeology contrats with the placelessness of digital efficiency.

Slow archaeology challenges any claim that gains in efficiency through the use of digital tools is sufficient reason alone to incorporate them into the archaeological workflow. It also recognizes that even though technological changes in archaeology occur in tandem with changes in method, practices, and the social organization of archaeological work, technology nevertheless has independent consequences. As Harvey (1990), Rosa (2013), Virilio (2005), and even Petrini (2003) have observed, the accelerating pace of a world saturated with technology has created new categories of experience, economic structures, and social relationships. The Latourian black boxes that have proliferated in archaeological research and have appeared regularly in archaeological methodology reflect a tendency toward uncritical occluding of technological processes in archaeological practice. Slow archaeology argues that the rapid pace of technological change and a critical, reflexive archaeology requires renewed attention to the place of digital tools in both field practices and methodology.

https://mobilizingthepast.mukurtu.net/collection/41-slow-archaeology-technology-efficiency-and-archaeological-work

http://dc.uwm.edu/arthist_mobilizingthepast/18

References

Alcock, S., and J. Cherry, eds. 2004. *Side-by-Side Survey: Comparative Regional Studies in the Mediterranean World*. Oxford: Oxbow.

Andrews, G. 2008. *The Slow Food Story: Politics and Pleasure*. London: Pluto Press.

Augé, M. 1995. *Non-Places: Introduction to an Anthropology of Supermodernity*. London: Verso.

Berggrenn, Å., and I. Hodder. 2003. "Social Practice, Method, and Some Problems of Field," *American Antiquity* 68: 421–434.

Berggren, Å., N. Dell'Unto, M. Forte, S. Haddow, I. Hodder, J. Issavi, N. Lercari, C. Mazzucato, A. Mickel, and J. S. Taylor. 2015. "Revisiting

Reflexive Archaeology at Çatalhöyük: Integrating Digital and 3D Technologies at the Trowel's Edge," Antiquity 89: 433–448.
Bevan, A., and J. Conolly. 2013. *Mediterranean Islands, Fragile Communities, and Persistent Landscapes: Antikythera in Long-Term Perspective*. Cambridge: Cambridge University Press.
Bintliff, J., P. Howard, and A. Snodgrass. 1999. "The Hidden Landscapes of Prehistoric Greece," *Journal of Mediterranean Archaeology* 12: 139–168.
Bloch, M. 1953. *The Historian's Craft*. Trans., P. Putnam. New York: Vintage Book
Bohrer, N. 2011. *Photography and Archaeology*. London: Reaktion Books.
Caraher, W. 2013. "Slow Archaeology," *North Dakota Quarterly* 80(2) [2015]: 43–52.
Caraher, W., S. B. Fee, and D. K. Pettegrew. 2013. "Taking Mobile Computing to the Field," *Near Eastern Archaeology* 76: 50–55.
Caraher, W., D. K. Pettegrew, and R. S. Moore. 2014. *Pyla-Koutsopetria* I: *An Archaeological Survey of an Ancient Coastal Town. American Schools of Oriental Research Archaeological Reports* 21. Boston: American Schools of Oriental Research.
Cherry, J. 2003. "Archaeology beyond the Site: Regional Survey and Its Future," in J. K. Papadopoulos and R. M. Leventhal, eds., *Theory and Practice in Mediterranean Archaeology: Old World and New World Perspectives. Cotsen Advanced Seminars* 1. Los Angeles: Cotsen Institute of Archaeology, 137–59.
Dyson, S. 2006. *In Pursuit of Ancient Pasts: A History of Classical Archaeology in the Nineteenth and Twentieth Centuries*. New Haven: Yale University Press.
Forte, M., S. Pescarin, E. Pietroni, and N. Dell'Unto. 2010. "An Integrated Approach to Archaeology: From the Fieldwork to Virtual Reality Systems," in F. Nicolucci and S. Hermon, eds., *Beyond the Artifact: Digital Interpretation of the Past. Proceedings of CAA2004, Prato, 13–17 April 2004*. Budapest: Archaeolingua, 325–334.
Frisch, M. H. 1990. *A Shared Authority: Essays on the Craft and Meaning of Oral and Public History*. Albany: State University of New York Press.
Gillings, M., D. J. Mattingly, and J. van Dalen. 2000. *Geographical Information Systems and Landscape Archaeology. Populus Monograph* 3. Oxford: Oxbow.

Gitelman L., and V. Jackson. 2013. "Introduction," in L. Gitelman, ed., *"Raw Data" Is an Oxymoron*. Cambridge, MA: MIT Press, 1–14.

González-Ruibal, A. 2008. "Time to Destroy: An Archaeology of Supermodernity," *Current Anthropology* 49: 247–279.

Harris, E. C. 1979. *Principles of Archaeological Stratigraphy*. London: Academic Press.

Harvey, D. 1990. *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change*. Oxford: Blackwell.

Herzfeld, M. 2007. "Deskilling, 'Dumbing Down,' and the Auditing of Knowledge in the Practical Mastery of Artisans and Academics: An Ethnographer's Response to a Global Problem," in M. Harris, ed., *Ways of Knowing: New Approaches in the Anthropology of Experience and Learning. Methodology and History in Anthropology* 18. Oxford: Berghahn Books, 91–110.

Honoré, C. 2004. *In Praise of Slowness: How a Worldwide Movement Is Challenging the Cult of Speed*. San Francisco: HarperSanFrancisco.

James, I. 2007. *Paul Virilio*. New York: Routledge.

Johnson, M. 2006. *The Idea of Landscape*. Oxford: Blackwell.

Kansa, E. 2012. "Openness and Archaeology's Information Ecosystem," *World Archaeology* 44: 498–520.

Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge: Harvard University Press.

Latour, B. 1993. *We Have Never Been Modern*. Trans. C. Porter. Cambridge, MA: Harvard University Press.

Leighton, M. 2015. "Excavation Methodologies and Labour as Epistemic Concerns in the Practice of Archaeology: Comparing Examples from British and Andean Archaeology," *Archaeological Dialogues* 22: 65–88.

Lucas, G. 2001. *Critical Approaches to Fieldwork: Contemporary and Historical Archaeological Practice*. New York: Routledge.

Maguire, R., and M. Shanks. 1996. "The Craft of Archaeology," *American Antiquity* 61: 75–88.

Martin, A. M. 2013. *Archaeology beyond Postmodernity: A Science of the Social*. Lanham, MD: Altavista Press.

McAnany, P. A., and I. Hodder. 2009. "Thinking about Stratigraphic Sequence in Social Terms," *Archaeological Dialogues* 16: 1–22.

Menand, L. 2010. *The Marketplace of Ideas*. New York: W. W. Norton.

Mickel, A. 2015. "Reasons for Redundancy in Reflexivity: The Role of Diaries in Archaeological Epistemology," *Journal of Field Archaeology* 40: 300–309.

Morgan, C. L. 2009. "(Re)Building Çatalhöyük: Changing Virtual Reality in Archaeology," *Archaeologies: Journal of the World Archaeological Congress* 5: 468–487.

Morgan, C. 2012. *Emancipatory Digital Archaeology*. Ph.D. dissertation, University of California, Berkeley.

Novick, P. 1988. *That Noble Dream: The "Objectivity Question" and the American Historical Profession.* Cambridge: Cambridge University Press.

Olson, B. R., J. Gordon, C. Runnels, and S. Chomyszak. 2014. "Experimental Three-Dimensional Printing of a Lower Palaeolithic Handaxe: An Assessment of the Technology and Analytical Value," *Lithic Technology* 39: 162–172.

Opitz, R. 2015. "Three Dimensional Field Recording in Archaeology: An Example from Gabii," in B. R. Olson and W. R. Caraher, eds., *Visions of Substance: 3D Imaging in Mediterranean Archaeology.* Grand Forks: The Digital Press at The University of North Dakota, 73–86.

Pavel, C. 2010. *Describing and Interpreting the Past: European and American Approaches to the Written Record of the Excavation.* Bucharest: University of Bucharest Press.

Perry, S. 2015 "Crafting Knowledge with (Digital) Visual Media in Archaeology," in R. Chapman and A. Wylie, eds., *Material Evidence: Learning from Archaeological Practice.* London: Routledge, 189–210.

Petrini, C. 2003. *Slow Food: The Case for Taste.* New York: Columbia University Press.

Pettegrew, D. K, S. Fee, and W. R. Caraher. 2013. "Taking Mobile Computing into the Field," *Near Eastern Archaeology* 76: 50–55.

Reinhard, A. 2015. "Three- and Four-Dimensional Archaeological Publication," in B. R. Olson and W. R. Caraher, eds., *Visions of Substance: 3D Imaging in Mediterranean Archaeology.* Grand Forks: The Digital Press at The University of North Dakota, 43–50.

Roberts, J. L. 2013. "The Power of Patience: Teaching Students the Value of Deceleration and Immersive Attention." *Harvard Magazine*, http://harvardmagazine.com/2013/11/the-power-of-patience

Roosevelt, C. H., P. Cobb, E. Moss, B. R. Olson, and S. Ünlüsoy. 2015. "Excavation is ~~Destruction~~ Digitization: Advances in Archaeological Practice," *Journal of Field Archaeology* 40: 325–346.

Rosa, H. 2013. *Social Acceleration: A New Theory of Modernity.* New York: Columbia University Press.

Sassatelli, R. and F. Davolio. 2010. "Consumption, Pleasure and Politics: Slow Food and the Politico-Aesthetic Problematization of Food," *Journal of Consumer Culture* 10: 202-232.

Shanks, M. 2012. *The Archaeological Imagination.* Walnut Creek: Left Coast Press.

Taylor, K. S. 1998. "Higher Education: From Craft Production to Capitalist Enterprise?" *First Monday* 3, http://firstmonday.org/ojs/index.php/fm/article/viewArticle/618/539

Thomas, J. 2004. *Archaeology and Modernity.* London: Routledge.

Virilio, P. 1986. *Speed and Politics: An Essay on Dromology*. Trans. M. Polizzotti. New York: Columbia University Press.

Virilio, P. 2005. *Negative Horizon: An Essay in Dromoscopy*. Trans. M. Degener. New York: Continuum.

Wilhelmson, H., and N. Dell'Unto. 2015. "Virtual Taphonomy: A New Method Integrating Excavation and Postprocessing in an Archaeological Context," *American Journal of Physical Anthropology* 157: 305–321.

Witmore, C. 2004. "On Multiple Fields: Between the Material World and Media. Two Cases from the Peloponnesus, Greece," *Archaeological Dialogues* 11: 133–164.

Witmore, C. 2009. "Prolegomena to Open Pasts: On Archaeological Memory Practices," *Archaeologies* 5: 511–545.