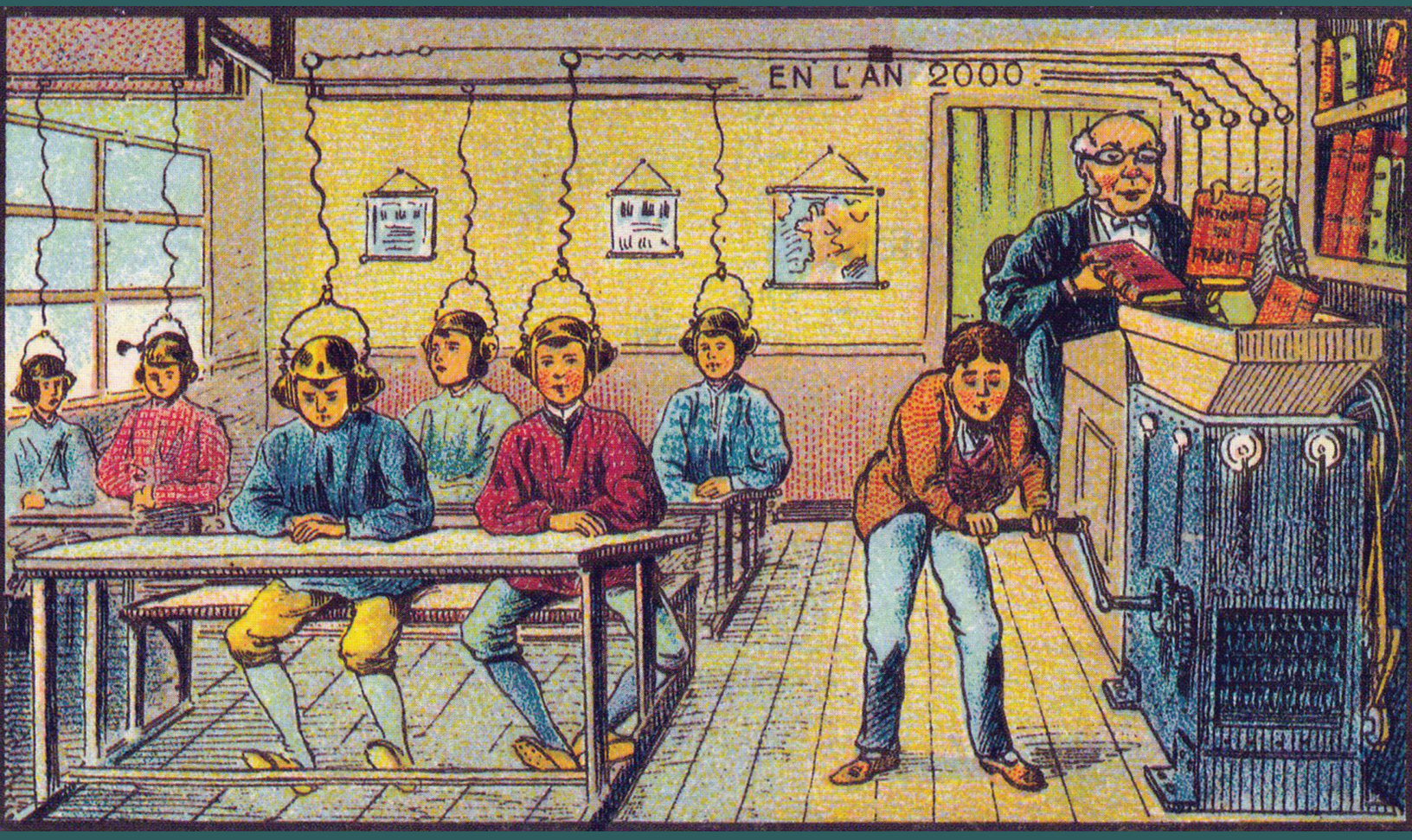
Critical Archaeology in the Digital Age



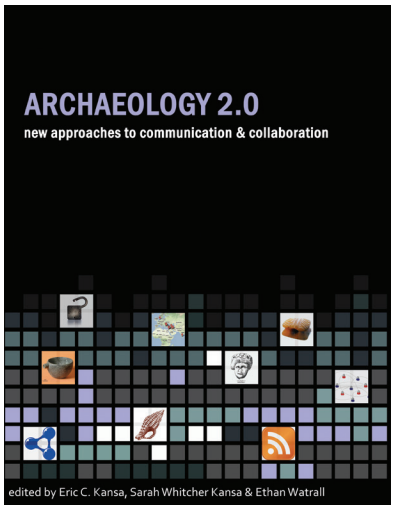
Edited by

Kevin Garstki

Critical Archaeology in the Digital Age

UCLA COTSEN INSTITUTE OF ARCHAEOLOGY PRESS
Digital Archaeology Series

Volume 1



Archaeology 2.0: New Tools for Communication and Collaboration

Edited by Eric C. Kansa, Sarah Whitcher Kansa, and Ethan Watrall

Critical Archaeology in the Digital Age

Proceedings of the 12th IEMA Visiting Scholar Conference

Edited by

Kevin Garstki

Cotsen Digital Archaeology Series 2

UCLA COTSEN INSTITUTE OF ARCHAEOLOGY PRESS

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Introduction

Challenges of a Critical Archaeology in the Modern World

Kevin Garstki

The final session of the 12th Institute for European and Mediterranean Archaeology (IEMA) Visiting Scholar's Conference at the University at Buffalo, the event that was the foundation for this volume, was scheduled to be a comprehensive discussion about common threads running through the speakers' presentations, touching on important take-aways from the conference. Instead, the discussion focused on whether institutions will ever recognize the value of digital projects or publications, and if it is possible to 'practice what we preach' regarding digital ethics. In particular, the discussion focused on how, or whether, we should try to publish this volume in an open-access format. This discussion included the acknowledgment of the potential irony if the volume were published only behind a paywall, considering that several papers discussed the need for a more open archaeology. Participants discussed the drawbacks of open-access publishing for early-career scholars, particularly for those attending the conference, worrying that open access is considered 'less than' in the eyes of hiring or tenure committees. We also discussed the impact of this model of publication on traditional norms in academia—an open-access publication strategy disrupts long-held views of legitimate publication, while also disrupting the publishing industry itself. Such a model challenges us to abide by our ethics of responsible archaeology and open science.

That conversation demonstrated precisely why our adoption and continued use of digital approaches to archaeological practice must be grounded in critical thought. The evaluation of new approaches demands that we rethink not only the technical standards and best practices for a tool or technology, but also requires a reevaluation of long-held frameworks for how, why, and for whom we practice archaeology. Critical archaeology does not suggest an aversion to emerging technologies in the field; rather, it is an opportunity to be intentional in our application of digital tools and consider the context in which we are using these tools. This book then acts as a call, and a demonstration how, to apply this intentionality and consideration to the ways in which we work, produce, and engage with digital things, as well as how we structure the professional institutions in which we are situated.

Challenges

Continuing our development in an all-digital discipline brings significant challenges not only for those working directly with the 'latest and greatest' technology but all archaeologists. Everyone participating in cultural heritage work is entrenched in the archaeological 'digital revolution' that has been ongoing since at least the development of micro-processors in the 1970s (Lock 2003:10). Echoing others (for example, Costopoulos 2016, Huvila 2018:1, Morgan and Eve 2012:523), archaeologists are so embedded in a digital society that no participant can avoid the challenges that digital archaeologies bring.

Data creation: The most obvious developments in archaeological practice brought about by the digital turn are in the realm of fieldwork; obvious because they stand out as distinct practices from field methods of the past. Yet past the superficial façade of 'new technology' are the ways these products and techniques force us to *think* differently, both in the field and out of the field. It is these cognitive shifts in our direct engagement with the archaeological record brought about through digital tools that are illuminated by a critical perspective on this transition. For example, mobile databases and structure from motion (photogrammetry) have become common tools for recording excavations in progress. However, Morgan and Wright (2018) have persuasively argued that traditional archaeological practices such as mapping or hand-drawing provide a deeper level of insight into the complexities of a site, insight that may be missed by using more regimented or standardized approaches to digital recording. A hand-drawn feature or profile map affords a level of creativity and embodiment that may not be possible when taking photographs for a photogrammetric model. Caraher (2013, 2016) has similarly suggested that born-digital recording practices, while not necessarily 'de-skilling' archaeologists, certainly resituate required knowledge.

These types of recording practices are not unlike the shift to scientific recording of the 1960s, with an eye toward recording as much as possible. And just like field recording in the sixties, digitally-based archaeological practices are situated in larger disciplinary paradigms and the data-creation techniques that influence the down-the-road role of these data. Digital recording techniques in the field have an impact not only on an excavation workflow but also on way archaeologists envision futures for the data they create. The role of data does not end in the field or with a write-up of the site. Archaeologists are now obliged to think like a database, not just to standardize recording practices but also to ensure that these data are eventually stored properly and maintained for future use. This is, of course, not necessarily how humans think. Faniel et al. (2018) demonstrated that both students and professionals require specific training to design recording strategies, as well as to use them. The idiosyncrasies of data recording on projects have given way to more standardized data structures, which has changed not only how these data can be reused but also the scale of our research focus, from small to large.

Data archiving and sharing: It is thus the development of our conceptual frameworks that have the wider effect of creating new modes of archaeological analysis and data futures. Instead of written field notes and forms languishing in dusty cabinets, archaeological information can be stored, collated, combined, reused, and shared. The first and last of that list are perhaps the most important evolution that digitality has brought to the way archaeologists think of the information they create. Long-term storage in a digital archive provides a level of sustainability for digitally-created data that is missing from analog recording (although see both Rabinowitz and Tringham, chapters 11 and 12 of this volume). The sustainability of our data remains a high priority, demonstrated by the increasing number of data repositories and archives (such as ADS, tDAR, DANS). It is clear that archaeological data, in all of their forms, do us no good if they are stuck on a hard drive after a computer breaks down or worse yet, stuck on a floppy disk made three decades ago that can no longer be read (see Jeffrey 2012). Data sustainability thus requires the challenging task of predicting the future—predicting what file types will be readable ten years down the road, or if the data is stored in such a way that it can even be accessed. The FAIR data principles (Findability, Accessibility, Interoperability, Reuse), for example, are one way that researchers can approach sustainable data futures (Wilkinson et al. 2016). These practices are a change to the way archaeological data are conceived, as future resources rather than just information about the past.

As a result of the push toward digital storage and data sharing, open data policies pervade the discipline. It is

not good enough to just create data, data must also be accessible. The ethos of open science in archaeology did not emerge with the onset of digital archives and repositories, but these developments provided a means through which open principles could be enacted. Data accessibility has become even more necessary considering the global Covid-19 pandemic occurring at the time of writing. The ever-growing body of archaeological data that is available through open-access repositories has the enormous potential to support teaching practices in university archaeology courses, especially in the event that courses must be taught in online and distance-learning formats. The pedagogical benefits of using these open-access datasets include allowing students to engage, and even struggle, with real-life (imperfect) data, and providing an example of reproducibility in archaeological analysis (Agbe-Davies et al. 2014). Also, if we are moving to a truly more inclusive discipline, having open data allows more widespread access to research without the barriers of expense and accessibility of frequent travel, avoiding ableism and benefiting graduate students, early-career researchers, and many others struggling with underpaid jobs while trying to progress in the field.

Data analysis: The larger amounts of archived data are slowly becoming part of bigger datasets of interoperable information, a facet of data reuse that was not possible in the past to this scale. These more expansive datasets, connected through shared standards and schemata, have been approached in similar ways to ICT 'big data.' In particular, geospatial, zooarchaeological, and DNA data lend themselves to big-data approaches due to the standardization of the data structures (see, for example, Supplement of *Journal of Field Archaeology* volume 45). Expanding upon the mission of data-driven approaches, machine learning relies on Artificial Intelligence (AI) to identify new patterns of archaeological data. Whether in airborne LiDAR datasets (Davis 2019) or classification of pottery (Anichini et al. 2020), machine learning has the potential to reframe the position of the archaeological researcher—from conducting the analysis to instead developing the training datasets and interpreting the outcome. An argument can be made that this development is both positive, by illuminating new patterns unidentified at smaller scales, as well as negative; one danger is that the scale of data used in these types of data-driven approaches increases the risks of false positives, letting the data lead the way rather than a hypothesis.

Publishing: Returning to the discussion at the end of the IEMA conference, alterations to academic publishing that are facilitated by digital platforms, and the open-science spirit that has accompanied them, challenge the traditional gatekeepers of academic capital and force the discipline to adjust its expectations of research outcomes. Digital technologies have significantly expanded the available ways to disseminate research and data, specifically web-based platforms. Instead of only publishing in peer-reviewed printed journals or monographs, digital scholarship can now be published in an ever-increasing number of web-based and/or open-access journals, it can be disseminated through open-access repositories or archives, and narratives can be shared through non-traditional digital media such as blogs or social media. Importantly, the labor that is required to make these 'non-traditional' products, which had in the past been relegated to the 'technician,' is becoming identified as worthwhile scholarly work that deserves recognition and academic capital (although see Štular, chapter 7 of this volume, about the need for more of this). Recently, both the Archaeological Institute of America and the Society for American Archaeology have added significant sections about digital scholarship to their guidelines for promotion and tenure. These institutions lend credibility to digital products that have, in the past, been viewed as 'less than.'

Challenges: The openness of information and communication that has accompanied social media, crowdsourcing and funding platforms, and open-access repositories has also brought challenges as to who has a role in the creation of archaeological content and narratives. Micro-blogging platforms such as Twitter provide an invaluable way to communicate archaeological discoveries, share ideas and information, and connect to existing archaeological communities. At the same time, however, there is potential for this mode of research to have a significant, if understudied, impact on communities engaged with them (Perry and Beale 2015, Richardson 2013, 2018, Walker 2014). There remains a danger that the post-colonial ideals proposed to be at the heart of archaeological practice on the social web may actually become neocolonial appropriation (Perry and Beale 2015), and there are potential dangers in the use of personal data in research (Richardson 2018).

In addition to research through the social web, other digital archaeological projects aim to involve and collaborate with publics outside of the traditional academic bubble. Yet what is often missing in projects that aim to involve public participation is a direct role for non-specialists in research design. Addressing this challenge begins with harnessing the aspects of digital archaeologies that provide a platform for multivocality. We can work to account for Indigenous and other stakeholder rights in the design of our projects and data publication (Gupta et al. 2020, Mickel 2020), and more consciously incorporate community voices in project design. Most public-facing digital archaeological projects that incorporate a 'citizen science' model of labor still reinforce a hierarchy that places the archaeologist at the top (Fredheim 2020); the research goal is still designed by the archaeologist. However, alternative approaches to community-driven research have demonstrated the need for reevaluation of who participates in research design (for example, Jones et al. 2018). By centering the collaboration with stakeholders in the design of archaeological projects, digital tools can be used with the public and for the public, rather than reinforcing traditional relationships of power.

The challenge for archaeologists is that a move toward open data and open archaeology often ignores traditional power inequalities inherent in archaeological work with Indigenous pasts. The adoption of approaches like the FAIR data principles brings about new challenges that pit best practices against sociopolitical realities. During this period of increased access to data it behooves archaeologists to examine how these practices affect the control of Indigenous data and the role of stakeholders in data governance. The recent CARE Principles for Indigenous Data Governance (Collective benefit, Authority to control, Responsibility, Ethics) address some of these issues as they relate to stakeholders traditionally removed from the archaeological project by focusing on how stakeholders may use, understand, be affected by, or are invested in archaeological research and the data it produces.

The challenge of 'forgetting the people' who are represented and affected by the data is also entangled with data-driven approaches to archaeological research. Techniques that often fall under the big-data umbrella require data that are of a scale which makes it impossible to truly understand their creation and the behaviors they represent. Huggett (2020) has recently noted that data-driven research risks alienating the people from the data by relying on a data fetishism that overlooks the inherent disconnection between past behaviors and the data that are presumed to represent those behaviors. This realization forces an acceptance of archaeology as a social discipline, of both people it studies and those doing the studying.

Digital technologies are a lens, one of many, through which archaeologists can examine methodological, epistemological, and structural traditions in the discipline, allowing us to build upon developments that came before and challenge the status quo. The evolutions in archaeological thought and technology do not exist solely at the level of archaeological recording or archiving but extend to the ways the discipline itself is conceived: impacting day-to-day practice, reframing how we think of archaeological futures, and the relationships archaeologists and the public have with archaeology. Katherine Cook has outlined the ways that the *deliberate* use of digital technologies has the potential to:

> i. confront the archaeological past we have created
> ii. confront the present (particularly of the discipline)
> iii. confront authorship and authority
> iv. act as platforms to support the above.
> (Cook 2019:402)

This potential requires an intentional use of digital tools and a critical perspective on process. The challenges we face come down to whether archaeologists of the 21st century can 'practice what we preach' or if we merely pay lip-service to the transformative power of digital archaeologies.

Critical Archaeology

Self-reflection is a necessity if the discipline is to extract the potential of digital tools while also limiting the negative byproducts of their use. We do not have a choice but to critically engage with our digitalism when so much of our practice is impacted by, or has the potential to be impacted by, digital technologies. Dennis (2020) has recently outlined how such a critical and reflexive approach to digital archaeology (and archaeology as a whole) is necessary to address significant gaps in archaeological ethics. So, what does a future critical archaeology look like? A critical

approach in 'the digital age' requires the reciprocal practice of creating knowledge, while at the same time acknowledging the circumstances in which that knowledge is created and enacted. A key here is thinking of technology as a process and not just a product. Processes occur within sets of intentions that are influenced directly by the paradigm(s) within which the practitioner is situated. It is therefore important to remember that paradigmatic change is not a product of technological change; they are intertwined and complement one another. A critical lens for archaeology in this case does not begin with how digital products are used but must focus on the reciprocal relationship between process and paradigm(s). Throughout the discipline, and especially in this volume, we see archaeologists thoughtfully engaging with broader disciplinary trends through the lens of digital technologies. The purposeful alignment of these lines of thought, digital and otherwise, have brought about some examples of necessary ways to practice archaeology. I see four major themes arising from a critical archaeology that should underlie our work moving forward and are also woven through the chapters of this volume.

Making

Archaeologists have always made *things*—data, reports, books; we just now make so much more, and most productive work is facilitated by digital tools. Significantly larger data came about through a wide range of developments, such as a larger number of excavations accompanying infrastructure projects, the appropriation of biochemical or DNA techniques in archaeology, and cameras capable of capturing large numbers of high-resolution images. With these conditions and adopted techniques we have increased our data production. These techniques are tending more and more toward the production of structured data, following strictly defined categories and observations that fit within a standard database structure. With these data we then make new things: predictive models, 3D reconstructions, or 'big data' analyses, in addition to the traditional products of archaeological work. However, structured data have the potential to mask archaeological variability. The context in which these data were originally created, combined with the production context of these secondary products, are demonstrably influential in the final outcomes. The important takeaway here is that how products are made affects their nature, how they are used, and how they shape future knowledge and discourse. From a technical perspective, recording this process is (theoretically) the role of meta- and paradata—tracking subjectivities and choices that may impact data or knowledge products. The desire to retain process in the data/product is not a new wish but one that is better facilitated by digital tools, where detailed process information can be connected directly to data without overshadowing or obscuring it. A renewed attention to the making of digital products provides a ground-up framework for purposefully designing and utilizing tools to meet the goals of the discipline or publics, and provides a space for intentionality in archaeological practice.

Engagement

The increasing attention archaeologists are paying to those outside of the discipline is hardly a digital development. This attention to various publics has spurred not only increased communication and collaboration, but also exposed alternative ways to think of our engagements with the archaeological record writ large. With terms like enchantment (Graham 2020, Perry 2019) or play (Di Giuseppantonio Di Franco, chapter 1 of this volume), there is an acknowledgement that we need not completely emphasize the 'serious' nature of archaeological research. The past sparks fascination and wonder for many. Digital tools have been harnessed to expand upon these types of engagements that tap into the sense of enchantment with the past or to facilitate play, from increasing gamification of archaeological interactions to providing platforms to touch (physically or digitally) reproductions of artifacts. We should continue to ask ourselves, why do we need to learn about the past only from a book,[1] a lecture, or artifacts behind a museum case? The platforms of the nineteenth and twentieth centuries afforded a particular engagement with the past, certainly, yet why should such platforms continue to dominate in the digital age?

Planning for the Future

A consideration of the future has been a part of archaeological practice through the last century, but it is becoming an increasingly important concern. We must now consider

1. I recognize the irony of writing this sentence in a book.

how the digital products of our archaeological making can (or should) last in perpetuity. This requires a more active consideration of the steps after the creative process: how to archive, to reuse, to access. Furthermore, the connection of data, documents, or other products takes a new form in the digital age. Connections have always been important in archaeological work, such as cross-referenced books and reports or card catalogs with linked keywords. But now, digital tools allow us to connect to more than could ever possibly be contained in a single lab or library.

Data futures also require a certain generosity on behalf of the researcher. Of course, we could always retain everything we produce on our hard drives, disseminate interpretation behind paywalls, and leave it to the next person to figure out what to do with our data after we retire or pass on. Yet, this does not seem to be the current trend in the discipline, even outside of a digital archaeology subfield. Open-data futures require a release of control over how one's digital products are used by others. It also requires a level of digital literacy to achieve the goals of sustainable futures; to ensure reuse and interoperability, data need to be in forms that allow reuse (legacy file types or standard ontologies), which requires forethought in the production process. However, this path is dependent on supportive platforms, institutions, and funding that are often beyond the control of the researcher. These desired futures thus require strategic investment of resources in the present.

Responsible Citizenship

Long gone are the days when we could view our work, process and product, as being somehow removed from all stakeholders in cultural heritage. As we confront the reality that archaeology is practice in the world, we are challenged with engaging in difficult discussions about the broader impact of our work. All stages of archaeological practice are embedded in sociopolitical institutions and formal and informal communities. As such, the design and use of digital tools in this practice cannot be conducted without the broader considerations of their impact; how does it help, and hurt, all stakeholders.

Furthermore, the concerns over the sustainability of data that support future archaeological research also challenge our everyday computational practice. Everything that we do as 'digital archaeologists' requires energy and other resources, for our tablets, cameras, computers, but especially the data centers that house servers maintaining our data. Data centers have to run all day, every day, requiring the constant use of cooling systems. The data centers in Europe will soon likely consume 104 TWh/year, or about 4 percent of the total EU energy consumption in the coming years (Bertoldi et al. 2017). Fossil fuels make up a large portion of the energy responsible for powering these centers. Archaeology is thus forced to confront the reality that with this larger shift to all-digital practices, our role in massive energy consumption, albeit still minor, will only continue to increase. That consumption does not even include the production of the components used to make the physical digital tools and their place in socially and environmentally exploitative systems. As citizens of the world, archaeologists are not passive but active players in global sociopolitics.

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What I hope to have expressed as the themes underlying a critical archaeology in the contemporary world is that we must practice archaeology with intention, particularly with the production and use of digital *things*. To be intentional in our use of techniques means we consider the full context in which the process is situated. This intention is exceptionally demonstrated in this volume, which also reveals the breadth and scale of digital work within archaeological practice and thought.

The volume begins with the section titled *Impactful Technologies*. While all the chapters in this volume in some way discuss how digital practice may impact our conceptions of the archaeological past, the chapters in this section outline case studies that demonstrate how certain tools are already having these repercussions. In the first chapter, Paola Di Giuseppantonio Di Franco examines how 3D digital and printed replicas of artifacts have the potential to alter visitor experience with cultural heritage through play and a tactile engagement with the object. Whereas artifacts in glass cases position visitors at a distance, 3D artifact prints contain a regenerative power that may make them more authentic than the real artifacts. In this case, the 3D scanning and printing of artifacts has the potential to shift how research is conducted on authenticity and object aura, and their critical and deliberate use in museum contexts

could transform heritage engagement in the future. Bernard Frischer and David Massey (chapter 2) follow with their examination of how 3D visualizations can move beyond their use as teaching tools and act as evidence in empirical research. By utilizing a 3D reconstruction of the Roman forum, developed as part of the Rome Reborn Project, they were able to demonstrate the potential for making structured observations and conducting experiments within a faithful reconstruction of ancient conditions. This approach, only made possible with hardware and software developed in the last few decades, brings not only phenomenological but empirical evidence to reinterpreting the long history of scholarship in this context.

Moving from empirical research to collaborative archaeology, Rebecca Bria and Erick Casanova Vasquez (chapter 3), outline how computational photogrammetry can be used with communities to disrupt traditional interpretive hierarchies. While working in Hualcayán, Peru, they explored the use of photogrammetry for an active co-creation of knowledge, as well as for education and storytelling. They specifically highlight how open-ended storytelling that makes use of digital and analog media has the potential to reframe the ways that students engage with prehistory and local archaeology. Patrick Willet and colleagues (chapter 4) continue the discussion of how relatively new technological methods can reframe archaeological narratives, but also how they may be used to contribute to and challenge traditional heritage work. They explore how predictive modeling of site locations in the regions around Sagalassos, Turkey based on decades of survey data, can provide meaningful input to governmental infrastructure planning. The role archaeologists have in heritage sustainability can be active instead of reactive in site preservation. Finally, Laura Harrison (chapter 5) demonstrates the impactful nature of a digital approach to post-excavation analysis, curation, data reuse, and media creation. Presenting the salvage excavation project at Seyitömer Höyük, Turkey, Harrison discusses how these at-risk heritage sites that may be excavated in less-than-ideal scenarios have the potential to be integrated into a holistic digital archaeology through a purposeful approach to the data. At the same time, these data provide opportunities to re-envision the ways archaeologists engage with various publics that make use of digital media, comic art, or 3D prints.

The second section of this volume, *Rethinking Data*, contains contributions that each address significant aspects of how data can be reconceived, shared, accessed, and ethically reused. Jeremy Huggett (chapter 6) begins this section by framing a future for archaeological practice that resists some of the worst impulses of data-centrism and instead relies on a 'slow data' methodology. As a reaction against the velocity of big data approaches, slow data allows researchers to *understand* the data more fully so that it can be used appropriately. A slow-data future challenges the recent excitement of data-driven, big-data archaeology to focus as much on the process of data creation as on the data itself. It is precisely the need to understand the data-creation process that underlies Benjamin Štular's (chapter 7) work on the sharing of airborne LiDAR data, or rather, the lack of a robust mechanism to communicate these data to other scholars. LiDAR-derived data have demonstrated significant potential to impact archaeological prospection, but Štular examines the developments that will be necessary for these data to reach their disruptive potential. Specifically, the academic community will have to recognize data processing and curation as scholarly endeavors, and adequately reward the labor that is expended on these practices, as well as creating a repository capable to allowing easy access to data.

Rachel Opitz and colleagues (chapter 8) also address the current limitations that exist for the reuse of 3D data. They look specifically at procedural modeling in archaeology, due to its complex and varied nature, as a basis for developing best practices in open 3D data storage and usability. In many ways, procedural modeling is better suited to the vision of FAIR data than other types of 3D data used in archaeology, due to their inherent reusability and the ability to track (re)usage. Complimenting this discussion is Eric Kansa's chapter (9) on data infrastructure and the intersection of archaeological data management, privacy, and surveillance. A critical examination of the infrastructures archaeologists rely on for our data illuminate the underlying dependencies on commercial services, which often clash with our ethical responsibilities.

In the final section, *The Past of Digital Futures*, the authors share perspectives on how future digital archaeologies will impact publication, data preservation, and global sustainability. William Caraher (chapter 10) begins this