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Digital Pompeii: Dissolving the Fieldwork- Library Research Divide

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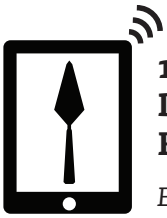

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Sometime before October 31, 1766, excavation began inside a porticoed building in the south of an area that would soon become the archaeological site of Pompeii (FIG. 1). The pace of work to clear the building was swift but episodic as crews were frequently reassigned to more exciting discoveries in the early years of Pompeii's rediscovery. Moving in bursts along the southern colonnade, the excavators seemed to be able to move at least 140 m^3 of material in a week before halting for nearly two months. Another burst of activity pushed to reveal the southeast corner, and the first half of 1768 was spent clearing the eastern colonnade (Pagano and Prisciandaro 2006: 58–64). Excavation of the northern and western colonnades is not specifically dated in the archival records, but images show that into the 1780s a great mound of volcanic debris at least 4 m high still covered much of these areas and persisted into the first decade of the 19th century (FIG. 2). In the course of those excavations, stunning images and artifacts were revealed, including real and painted armaments that would give the Quadriporticus its colloquial name: the Barracks of the Gladiators (FIG. 3).

The precise date when excavation in the Quadriporticus was completed is not terribly important as the volume of material removed was astounding: over 15,000 cubic meters of earth, ash, and lapilli were removed, as well the trees that grew atop the buried city. On average, 18th-century excavators (and we should hesitate to call them archaeologists) removed at least 300 m^3 of material each year from the Quadriporticus, but that average dramatically underestimates the pace of work. We know that at times they could shift two-thirds of that in a single week; for example, from February 14th to February 21st,

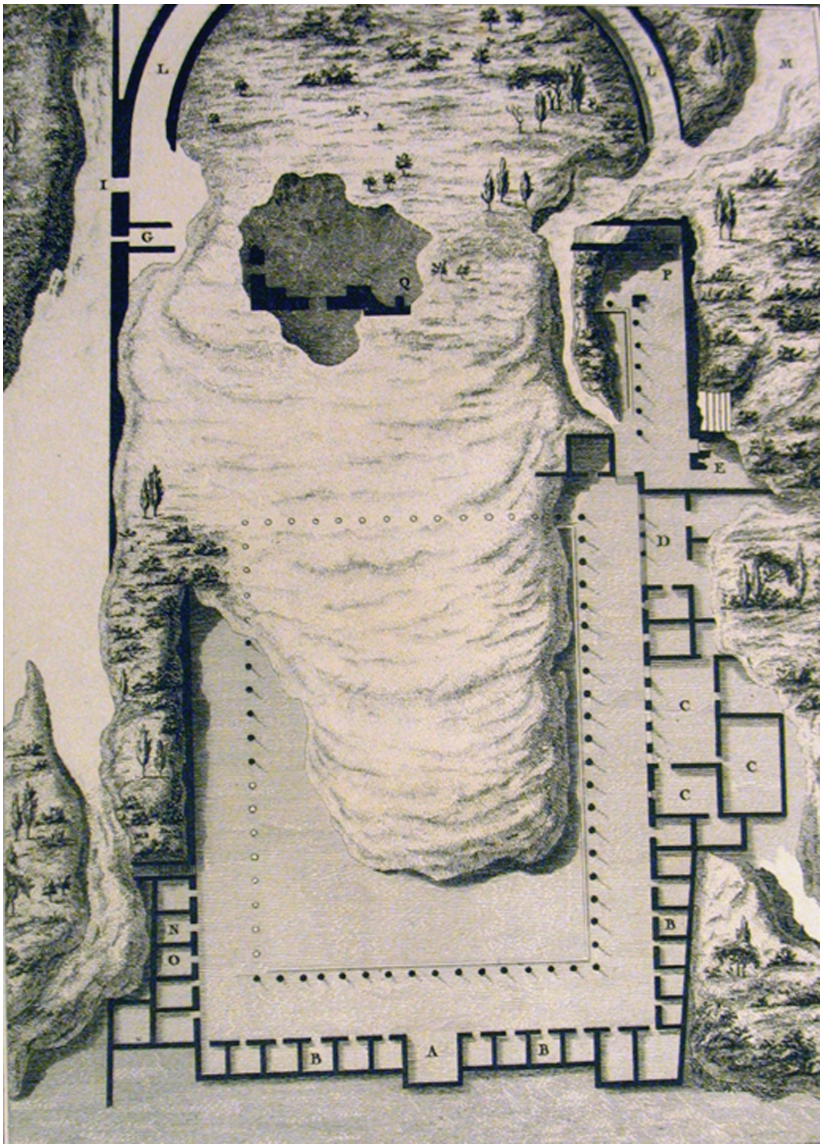

Figure 1: Plan *Géométral de l'Etat actuel de la fouille du Quartier des Soldats à Pompeii*. Reproduced from de Saint-Non 1781–1786, vol. 2, pl. 84.

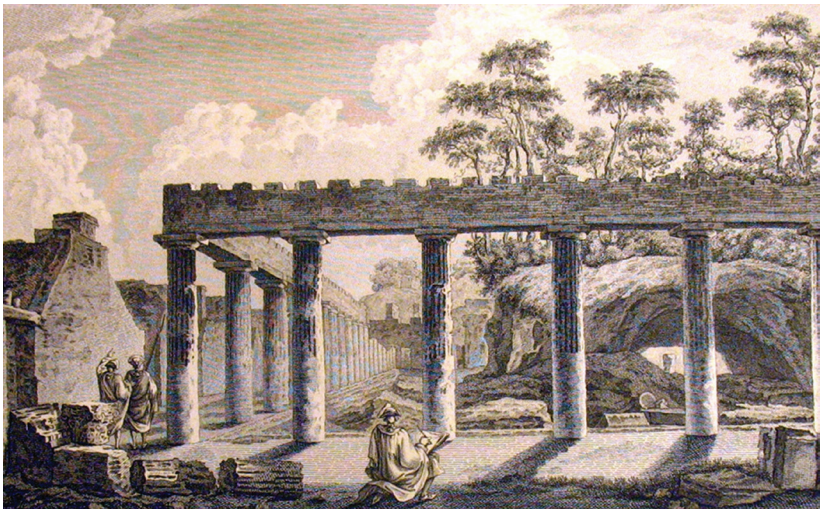

Figure 2: *Vue Perspective de la Colonnade du Quartier des Soldats à Pompeii*. Reproduced from de Saint-Non 1781–1786, vol. 2, pl. 86.

Figure 3: Detail of a gladiator's helmet in a fresco depicting armaments from the Quadriporticus. (MANN n. 9702). Photo by Bettina Bergmann.

Figure 4: Insulae VIII 7, 1-15 and I.1: plan of trenches, 2005–2012. Pompeii Archaeological Research Project: Porta Stabia. Map courtesy of Steven Ellis.

1767, an estimated 212 cubic meters of material from the southern exedra and its adjacent colonnade was cleared (Pagano and Prisciandaro 2006: 60). By contrast, modern excavation at Pompeii is excruciatingly slow. In eight years of research on the pre-79 A.D. development of insulae VIII 7, 1-15 and I.1 (FIG. 4), the Pompeii Archaeological Research Project: Porta Stabia (hereafter, PARP:PS; http://classics.uc.edu/pompeii), directed by Steven Ellis, excavated 40 trenches below the final Roman levels, exploring 770 m^2 of the 2,660 m^2 of these humble city blocks, and removed about 1,150 m^3 of material (see Devore and Ellis 2005, 2008; Ellis and Devore 2006, 2009, 2010; Ellis *et al.* 2011, 2012, 2015).

The PARP:PS excavation seasons are only five weeks long, so the average pace of excavation is 29 m^3 per week, or 10% of the average rate of the previous (Bourbon-era) excavators. While only 80 objects were recorded in the Quadriporticus (concentrated almost entirely in the first three years; Pagano and Prisciandaro 2006, vol. II, 259–60), PARP:PS recovered more than 280,000 objects during their eight years of investigation. Moreover, Ellis and his team identified and documented over 4,500 individual stratigraphic units (SUs) to which these finds belong and relate, providing, on average, an archaeologically meaningful distinction to every 0.25 m^3 of soil at a rate of 114 times a week (S. Ellis, personal communication). By contrast, the archival records of the Quadriporticus make no useful mention of any distinction in what they were digging through.

Between 2010 and 2013 I directed a non-invasive, born-digital, architectural analysis project in the Quadriporticus with Ellis that sought to decode the construction and life history of this remarkable structure that had existed for over two hundred years in both the ancient (ca. 130 B.C.–A.D. 79) and modern (1766–present) eras. In addition to understanding the building, part of our research design was to test how far one could extend and how much one could gain from non-invasive techniques and technologies. Our plan included the use of excavation data from PARP:PS, but permitted no new trenches. In the four, three-week campaigns of the Pompeii Quadriporticus Project (hereafter, PQP; https://www.umass.edu/classics/pqp) we recorded over 2,500 stratigraphic units reflecting changes to the masonry, decor, and function of the Quadriporticus and documented another 1,700 SUs within the 77 columns of its colonnades. On average, we identified and documented more than 350 stratigraphic units per week.

Workflow is Dataflow

The point of this unequal and perhaps even unfair comparison is to draw a stark, unmistakable line around an obvious statement: as the priorities of archaeological research have changed, so too have our methods, techniques, and results. The dominant trend, at Pompeii and elsewhere, has been an ever-widening gulf between the decreasing volume excavated and the density of material recovery and documentation. Indeed, PQP recorded as much stratigraphic information as any other research project without conducting any excavation. While modern research projects have fewer infrastructural and logistical challenges compared to early modern excavations in managing smaller labor forces for shorter periods, our ethos of information maximization has replaced these with an enormous data management load. Today, every project has a database and most have an organizational chart of personnel that represents a map of dataflow through that project: from excavators to trench supervisors to object specialists to directors (e.g., see in this vol. Motz [Ch. 1.3]; Wallrodt [Ch. 1.1]). On the front line of excavation are spatial people, the taphonomic specialists (i.e., excavators) who interpret and faithfully record every aspect of a trench, but who also give up much of their object analysis to the next layer in the flow of evidence. It is the object specialists who provide the final identifying, functional, and chronological information for the artifacts recovered. In some cases it is first up to the trench supervisor to minimally reintegrate the specialist's spot reports back into excavation practice. Ultimately, it is the project director's responsibility to reunite the space of a trench and the objects ripped out of it and place it within a historical narrative that explains the social forces in the past that brought these material realities into being. There are still more processes and personnel on a modern research project. Many projects have an artifact registrar, spatial specialists (who work with survey instruments, computer-aided design [CAD], geographic information systems [GIS], or the like), and now dedicated information technologists to deal with the constant flow of data and metadata that results from archaeological research.

In addition to and in place of these information specialists, some projects have looked longingly toward the revolution in portable computing and information technologies. These devices and software

(particularly tablets and drafting apps) have allowed archaeologists take the work of data management back to the trench edge and make it the point of origin for precise and accurate digital recording. As many contributions to this volume demonstrate, we have already witnessed the first part of the revolution of our discipline: the transformation of archaeological methods of data collection and, to a lesser extent, how such data are accessed and deployed in the field. Today iPads are everywhere, and though they are the flavor of the moment and eventually will be superseded, they are not going away.

Such is the formulation of modern archaeological practice: dense networks of technology and personnel enmeshed within an ethos to collect more evidence from smaller trenches using less invasive methods. It is within this context that I want to explore what I believe will be a second act in our revolution in digital archaeological practice. Put simply, in the very near future, an entirely new set of tools and an enormous dataset for archaeological inquiry will also arrive at the trench edge: the library. It is a good thing in theory to bring all information to bear on a given inquiry, but in practice we know that it is not only impossible, but often counterproductive to try to employ every method or apply every dataset to a given problem. Breaking down the geographical wall between fieldwork and library research—the hundreds to thousands of miles separating the field site and the university—is well underway, but its impact on how archaeologists do research is yet unknown (or rather, yet undecided by us).

Technology > Method > Interpretation

In what remains of this article I want to very briefly outline two projects I direct that scratch the surface of this second act in digital archaeological practice in order to explore very briefly what the future might look like. These examples demonstrate the value of doing archival research in the field and that soon a visit to Pompeii can mean a tour through its bibliography as well. The mechanisms by which we deliver secondary materials to the field are already being built, and now we must begin to question how to incorporate books and articles (at least) into our actual fieldwork practices. To do this we need to begin to imagine not only the possibilities, but also the impediments: when do we dig and when do we read? Most importantly, if we are go-

Figure 5: Watercolor of fountain and interior of the Quadriporticus. W.J. Hüber, lithograph by L. T. Müller, 1818–1819. Columns of tholos are circled in light blueReproduced from Pagano and Prisciandaro 2006: 176; copyright by N. Longobardi.

ing to integrate a significant component of secondary source material, we must also ask: where in the process will we find the time to do so?

The first project, the Pompeii Quadriporticus Project, has already been introduced as part of the opening discussion on the increasing elision between fieldwork practices and information management. In this context, PQP's use of more than 186 archival images in the field to identify and document changes to the building that occurred in the two and one half centuries since its initial excavation are also relevant to the fieldwork-library question. These images were loaded into both an offline database and an online (and now defunct) platform called DM, which provided a set of basic markup tools for drafting and annotating the images themselves as well as creating links between images (Poehler and Ellis 2014: 3–4). It was during the process of examining these archival images, and creating an absolute (by the dates of the images) sequence of modern architectural changes to the Quadriporticus, that we first noticed that a few important components of the building' s architecture had been removed. The most obvious removal was the large fountain that several artists and cartographers had depicted in the northeast corner of the portico prior to 1837 (FIG. 5).

Less obvious was the circular, colonnaded structure that had once existed—or was still under construction—in the center of the Quadriporticus. Hints of this tholos-like structure were first noticed as curious stray column drums along the edge of the unexcavated central mound and in the column standing in the tunnel excavated through it (FIG. 2). It was only when looking for images of the lost fountain that we noticed a circle of column drums surrounding a cylindrical altar or cistern head (Poehler and Ellis 2014: 4–6). That some circular structure inhabited the middle of the Quadriporticus was not surprising to us: our ground-penetrating radar (GPR) results had already proven its existence (FIG. 6). A cursory examination of early maps of Pompeii (and an over-abundance of caution), however, had convinced us that these subsurface structures were related to the center of a modern cruciform garden design imposed on the interior of the colonnade (Poehler and Ellis 2012: 3–4). The combined weight of imagery from both the 19th and 21st centuries, however, could not be ignored and caused us to change our interpretation. Interestingly, another image with evidence for the circular structure was identified by Ellis while in the audience at the "Mobilizing the Past" workshop (FIG. 7). The drawing by Gudeson, made from his balloon flight over Pompeii in the

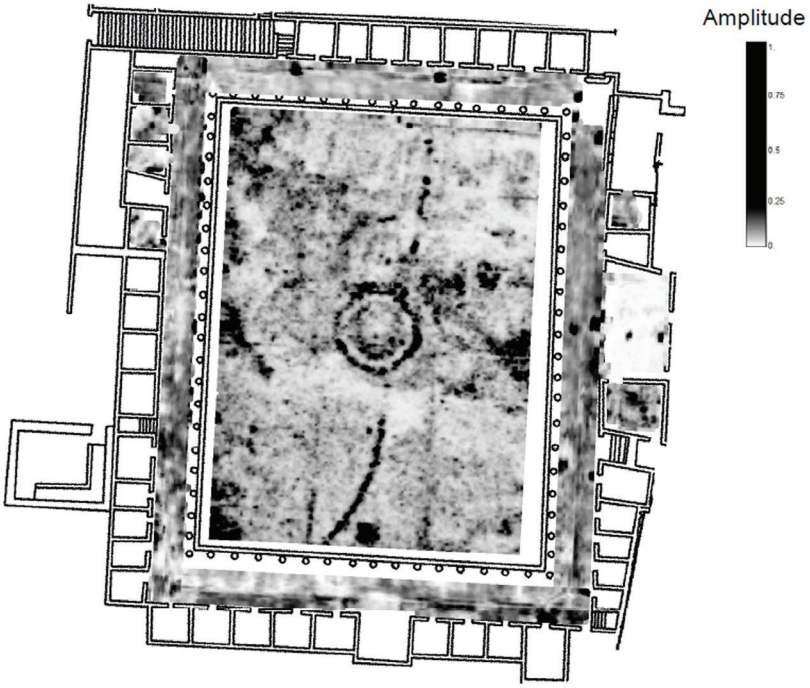

Figure 6: Ground-penetrating radar image of the Quadriporticus, slice 4 (depth ca. 66–92 cm).

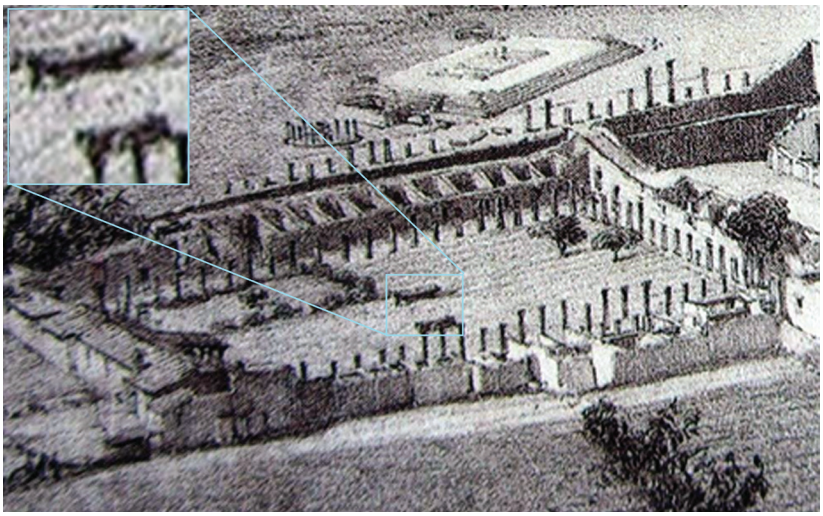

Figure 7: *Vue prise au dessus de l'Odéon de du Téàtre tragique*.
Drawing by A. Gudeson, reproduced from Etiennez 1849–1852, pl. 15.

1840s, shows—when highly magnified or when projected onto a 30 foot screen—a circular projection in the center of the Quadriporticus.

For PQP, the impact of having and interrogating archival materials in the field—in databases on our iPads and in online markup environments (DM)—was both immediate and enormous. Suddenly, our building possessed a structure not seen in nearly 180 years, which changed that building's basic appearance from a Hellenistic gymnasium to a 2nd-century A.D. Macellum. It is the aspiration of the second project I direct to make this kind of discovery from in-field archival and secondary-source research possible for every building at Pompeii. The Pompeii Bibliography and Mapping Project (PBMP; http://digitalhumanities.umass.edu/pbmp/) is the attempt to graft a bibliographic catalog of more than 20,000 references onto an online GIS map (or maps) with thousands of spatial objects. On their own, each component creates a new tool for researching the city that has never before been available in digital form. Together these datasets offer an unique opportunity to explore at once the physical, cultural, and narrative landscapes of the most important site in the world of Roman archaeology. By collocating spatial and bibliographic information within a single representation, users can find information about the ancient city in a particularly intuitive manner—by simply clicking on the space of one's interest.

The true value of the PBMP, however, will come as a querying tool. Attaching the bibliographic data to the GIS permits one to use spatial categories to sort through thousands of citations that might be related only by the locations referenced in those texts. Moreover, because one can sort the bibliography first by the size or variety of a building type (e.g., a house or its area in m^2), its locations in the city (e.g., insula 1 of Region I), and their relationships to other kinds of structures (e.g., workshops), unique and powerful questions that once took weeks to generate the data for will now only take minutes. It is in such experimentation that I hold the greatest hope for the PBMP and where I expect that its use in the field will be the most novel (see Poehler 2014 for an example). Certainly, the ability to quickly find materials on topics related to one's fieldwork will be valuable, but greater still will be the ability to create maps and bibliographies of comparanda for the features and finds discovered in the course of archaeological research.

While the PBMP will have an important impact, it is important to recognize that we already choose from among many possible aspects

of research moment by moment while in the field: from excavation, to primary and secondary analyses, to phasing and contextualization, and finally to report and publication writing. To put this more simply:

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

These activities are natural allies in a process of understanding the past, and there are many reasons why doing all these aspects in the field makes sense. But the purpose of this reductive adumbration is to make easier the task of considering the times when we currently introduce information from secondary sources and where we might add still more in the future.

So when do we think we would want to have access to and read secondary sources? Situations include:

1. *Excavation*: when discovering an unusual feature (e.g., a kiln or soil layer).
2. *Artifact analysis*: when discovering an unusual object (e.g., rare material or form).
3. *Synthesis*: when the combined data lead to a surprising result (e.g., when discovering your building is another building).
4. *Writing*: when making an argument supported by facts (i.e., all the time).

Currently, at the moment of excavation, there are relatively few opportunities to incorporate library resources. Excavation, or equally pedestrian survey or masonry analysis, is primarily a manual process of sampling, collection, and recording that tends to limit the subjects relevant to read about. Background information on the geology or later ancient and modern histories of a location seems an appropriate topic to investigate while digging (or equally, in preparation for digging). The discovery of an important feature, such as the kiln found near the Porta Stabia in 2012 might also drive an excavator toward secondary source materials in order to help understand the function, distributions, and known forms of other excavated kilns (Dicus 2014,

Figure 8: Photogrammetrical models of (from left to right) Room 35, Column 59, and Room 61 from the Quadriporticus.

Figure 9: View inside the Altstadt sewer, facing north toward the Large Theater and farther to Stabian Baths.

66–67; Ellis *et al*. 2015: 2–5). The study of unusual objects at the level of artifact analysis would also benefit from a direct connection to sources of comparanda for identification, dating, and the determination of function. Looking toward the future, we should imagine consulting not only standard reference materials of canonical types, but also multiple examples from previously excavated sites in the form of narrative, detailed imagery, and three-dimensional models (FIG 8; see also Kansa, Ch. 4.2, this vol.).

In the future, the point of synthesis seems a natural place to expand our use of library resources in the field. Synthesis is an all too neat word for the sloshing back and forth between individual interpretations of data and the arguments they are meant to support. Such messiness, however, makes room for other peoples' interpretations, for comparanda, and for unexpected parallels. I suspect that this will be one activity expanded by access to a library in the field. At the same time, it seems equally likely that the some of the research burden for making initial identifications and interpretations of objects, features, or soils will fall to the trench supervisor during the workday. Those excavators who can generate not only an interpretation of the trench's stratigraphy, but also equally timely and synoptic bibliographies on the fish vats, bar counters, drains, or beaten earth streets will make a valued contribution to the stage of synthesis and writing.

Pay It Forward: Doing More with More

How, then, will we "pay" for the extra time needed to do secondary source research in the trench or at the specialist's desk or at the dig house dinner table? That is, how will we replace the lost time for digging, analysis, interpretation, or, more likely, for sleep or relaxation? Excavating fewer trenches certainly is a possibility, but studying them with less intensive methods is not. Another answer will be to find efficiency elsewhere in the process. For example, for PQP, it was in part the speed at which we could document (not make) our interpretations of each wall in a drawing that bought the time to do both the archival research and the detailed examination of the columns in the Quadriporticus. What once took an hour to an entire day for two people to accomplish—stringing a baseline, setting up a drafting board and Mylar sheets, taking scores of individual measurements by hand and

shouting them to a draftsperson who transposed then into a scale drawing—now could be done by a single person in 30 minutes using the camera and a drafting app on the iPad. Additionally, because PQP closely and intentionally paralleled the processes of archaeological workflow (organization of fieldwork practices) and the dataflow (organization of data derived from fieldwork practices) we made thousands of archaeological observations instantly ready to be combined not only with the observations from other walls but also from rooms and even whole sections of the building. For us, an explicit goal was to reach a stage of interpretation and synthesis beyond an individual wall while still in the field. To do this, we utilized the expertise created within our staff – those individuals who had just analyzed those walls – as well as our digital infrastructure that had contained explicit linkages between evidence and its interpretation. We "paid" for the time to synthesize our interpretations with the increased speed in graphically recording those interpretations.

If the Pompeii Quadriporticus Project were to be started 10 years from now, I imagine we would put greater emphasis on reading about the implications of our initial observations and interpretations, such as understanding the rest of the great Altstadt sewer (FIG. 9) that passes through the Quadriporticus or the use of specific construction techniques and materials in the rest of Pompeii. Certainly, in this imagined future I might have tackled the archival and bibliographic research in search of the tholos structure the very week the GPR results were received, rather than two years later. Finally, I imagine that we would build time to accommodate the most important analog tool we will still be using: the human brain and all its psychological conditioning and quirks (for more on this topic of "Slow Archaeology," see Caraher, Ch. 4.1, this vol.). Though I have no doubt the future will be "slower" than it is today, I am equally sure that the time for such reflection will come, ironically, on the back of efficiency somewhere else in the fieldwork system.

In sum, the library is coming to a future trench near you. With it are possibilities and pitfalls yet unimagined. This paper has tried to illustrate a few ways the introduction of published scholarship (but only hinted at published, open-data archives) might impact archaeological fieldwork and further imagine its place in the digital archaeological practice of the future. But these few hundred speculative words cannot compare with the value of our collective endeavors— and failures—in

the coming decade. Our experiments to dissolve the library-fieldwork divide will not only find the best and worst places to insert this new dataset into our practices, but they also will bargain with other activities to find the time for such insertions. New efficiencies will be found to implement the library resources and they likely will come at the trench edge, squeezing excavation supervisors—the middle management of archaeological fieldwork—between a confrontation with the physical world and an increasingly complex digital representation of it.

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