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# Pencils and Pixels: Drawing and Digital Media in Archaeological Field Recording

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## ABSTRACT

Within the context of a growing emphasis on digital recording, what is the place of analog drawing in archaeological fieldwork? In this article, we situate the increased application of digital drawing methods by providing several historical examples of archaeological field drawing in British archaeology to demonstrate the connection between understanding the archaeological record and illustration. Given this background of analog archaeological recording, we then explore the current state of archaeological field drawing and the affordances of digital illustration for recording and interpreting the archaeological record, review literature in architecture and design regarding the cognitive function of analog and digital drawing, and discuss the possible future implications of born-digital or paperless archaeology.

## KEYWORDS

Illustration; archaeology; field drawing; archaeological illustration; digital archaeology

## Introduction

Field drawing in archaeology is a transformative act. During excavation, the visual record becomes the mediated expression of the archaeological resource. As each layer is recorded, it is then destroyed, carefully and methodically, but irrevocably. The physical entity is seen, understood, and interpreted through many different eyes, and then inscribed through the actions of many hands, into disparate two-dimensional records (Edgeworth 2003; Reilly 1991: 135). The visual record is then remediated during the post-excavation process of aggregate narrative building (Tringham et al. 2007). For Jonathan Bateman, understanding the interpretative processes that occur during these transformations is critical:

The intimate relationship between the destructive and creative processes that are excavation, and the archaeological drawings that both drive and witness them, puts the act of drawing at a conceptually crucial stage in the archaeological production process. The potency of this interpretive step becomes inextricably intertwined with both previous and later interpretative and creative stages, such as the physical excavation itself and the writing of narratives of the past based on that excavation. (2006: 69)

Visual communication of our interpretations has been an integral part of the discipline of archaeology from its inception (Moser 2012). Drawings, photographs, and reconstructions present compelling archaeological arguments, constructing and animating the past for present audiences. Yet visual media is often marginalized, and this has certainly been the case for archaeology (Gamble 1997: xvi), though this has been remedied somewhat in recent years (Bohrer 2011; Molyneaux 1997; Perry 2009, 2014; Shanks 1997).

Field drawing differs from other forms of visual media in archaeology in both intention and execution. With the exception of excavation photography, drawing is the only form of recording used expressly as a visual interpretive replacement for the archaeological record as it is destroyed. Field drawing has divergent origins with strong regional traditions, incorporating other disciplines, including visual art, illustration, and design. While other aspects of archaeological

visualization also involve the mediation of three-dimensional objects, buildings, and people, we identify field drawing as a particular nexus of performative interpretation. (Carlson [2014] offers a similar critique of digital media in artifact illustration.) Field drawing is the last form of recording where much of the work is still done by hand. The term “by hand” can be problematic, as arguably the use of a stylus and tablet computer is a skeuomorphic emulation of drawing with a pencil and paper, but here we use “by hand” in the idiomatic sense, to indicate a lack of automated or machine assistance. The use of visual aids such as graph paper precludes the use of the term “free-hand drawing.” This necessarily highlights the ambiguity of our study; the use of a portable grid, compass, tape measure, or alidade may constitute a kind of machine assistance in illustration. Whether sketched on recording sheets, drawn on permatrace, vectorized, or born digital, the gathering of archaeological field data is an embodied expression of archaeological interpretation, one that is contingent on the understanding of the archaeologist and the affordances of the media used to represent these data (Edgeworth 2012; McFadyen 2011).

As archaeological fieldwork is increasingly adopting digital recording strategies, it is important to consider the place of field drawing in the greater context of representation in archaeology (Edgeworth 2014). Digital methods have not entirely replaced hand drawn visual archaeological records, particularly among projects with lower levels of funding. While digital survey equipment is relatively commonplace for creating much of the large-scale data capture across a site, the intimate recording within a stratigraphic unit is still largely the purview of pencil on transparent drafting film (permatrace) in the United Kingdom, or on paper in other places. Current visual archaeological recording uses a variety of media, some born digital and some digitized at a later point (Hopkinson and Winters 2003). For example, photography in archaeology has become almost entirely digital (Morgan 2016). While early use of digital photography was largely skeuomorphic, the adoption of new techniques such as structure-from-motion imaging, drone photography, and

geomedia are also profoundly changing archaeological visualization. Alongside a large increase in the photographic record due to the adoption of digital imaging techniques, the increased use of digital survey, drawing, and terrestrial 3D laser scanning has produced a growing vector-based primary data record.

Within this context of an increased use of digital recording, we pause to ruminate on field drawing in archaeology. Using pencil and paper for field drawing requires a translation of form, the ability to recognize and depict change in the archaeological record at scale, onto a blank plane. While there is some variability, digital recording in archaeology has centered on the use of tablets to create the primary record. Though some tablet recording may use blank screens, most paperless workflows involve taking a photograph, then tracing on top of that photograph to annotate it with linear or textual information (Berggren et al. 2015; Ellis 2016; Wallrodt 2011). Paperless advocates seem to accept this shift in method without much consideration; indeed, they celebrate the ease and accuracy that such a change would create. Yet, we are given pause. We ask, does tracing lines onto a photograph on a screen change our engagement with the archaeological record? Does the mediating window of a tablet change drawing as an interpretive act? Consequently, does it turn archaeological drawing into an appendage of archaeological photography, and therefore perhaps not necessary at all? What is the place of more interpretive illustrations, such as isometric sketch drawing? Finally, does drawing help teach archaeological seeing? In this article, we consider these questions with regard to analog and digital drawing in archaeology. Further, we argue that drawing is a critical skill that, through close observation, structures our understanding of the archaeological record. Digital methods must incorporate these considerations.

To situate our argument, we provide historical examples of archaeological field drawing. These examples demonstrate how a drawing can reveal our relative knowledge and engagement with the archaeological record and its entanglement with historically contemporary aesthetics. Though there are distinct genres of field illustration in other regional archaeological traditions, we focus primarily on British archaeological recording, as an example of well-established and broadly understood standards for illustrations (Adkins and Adkins 1989). Given this background of pencil and paper archaeological recording, we then explore forms of digital illustration for recording and interpreting the archaeological record, discuss drawing and cognition as studied in the fields of architecture and design, and then consider the future of knowledge production in archaeology.

### Examples of Historical Field Drawing

In the 1960s, Stuart Piggott and Brian Hope-Taylor wrote several articles documenting the history of draftspersonship within British archaeology with the intention of informing good practice (Hope-Taylor 1966, 1967; Piggott 1965). Piggott's history traces archaeological field drawing to antiquarianism, where it was important to provide "an accessible corpus of material from which typological and taxonomic systems could be developed from criteria more suitably presented visually than in words" (Piggott 1965: 171). During the seventeenth century, antiquarians such as John Aubrey began to produce what we would now recognize as

prototypical plan drawings resulting from survey, as with his work at Avebury ([FIGURE 1](#)).

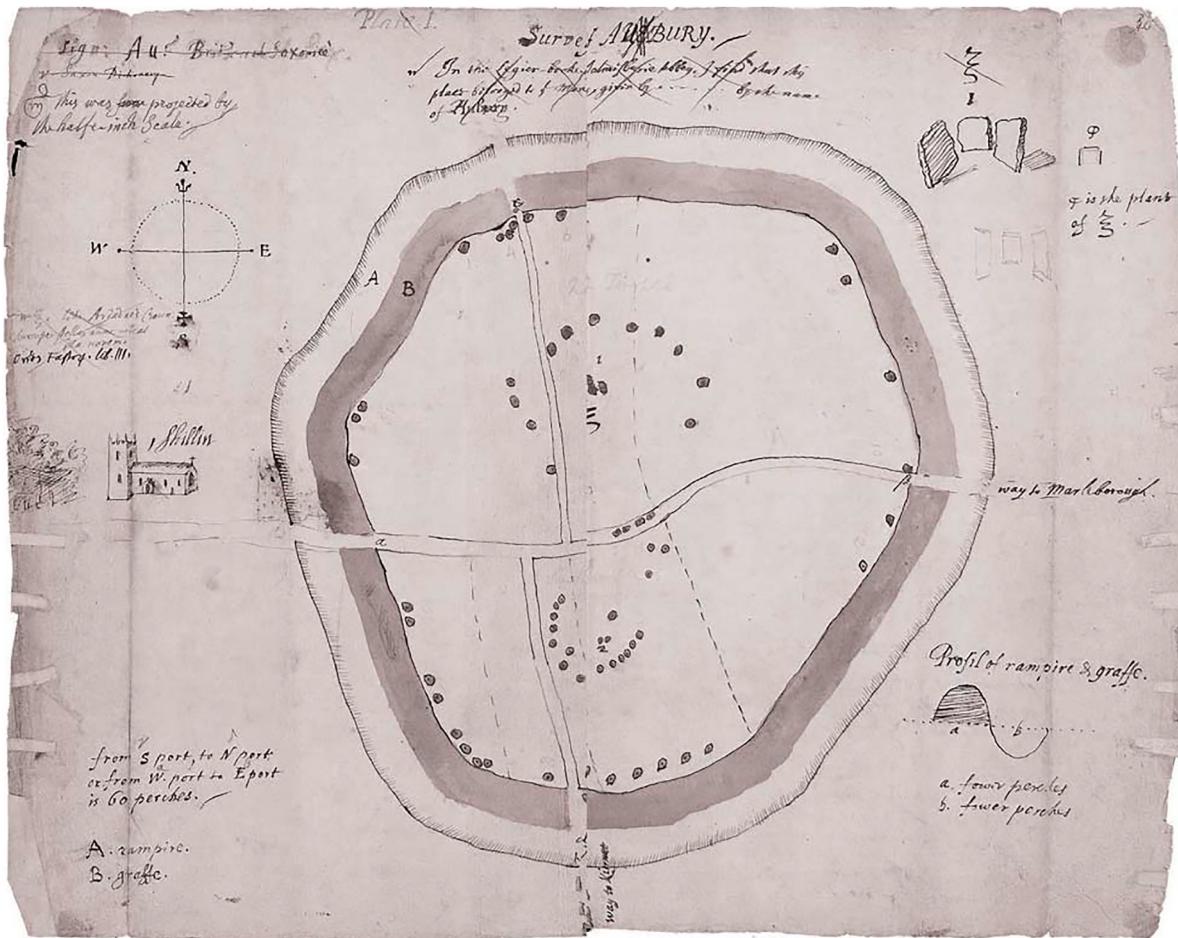
During the eighteenth century, antiquarianism began to embrace the scientific principles associated with the Enlightenment. As Northern Europe began to understand a pre-Roman past, William Stukeley and others first attempted relative dating for sites for which there was no associated written record (Trigger 1989). Stukeley produced drawings of Avebury and Stonehenge, but in a Romantic style. This resulted in a move away from a more scientific documentary approach, to drawings resembling landscape painting. Methods would remain relatively unchanged in Northern Europe during the 18th and early 19th centuries (Piggott 1965).

Meanwhile, in the Mediterranean and Near East, methodologies were beginning to change. The density of occupation in these sites called for better ways to discern small temporal changes, and this resulted in advances in several areas, but particularly in stratigraphy, and therefore section drawing. Meticulous section drawing was pioneered by Giuseppe Fiorelli, working in Pompeii, and then refined by Alexander Conze and Ernst Curtius while working at Samothrace and Olympus, respectively. Conze and Curtius recognized that archaeological excavation destroyed the site, and therefore, they should create a written record to replace the archaeological resource as they destroyed it (Trigger 1989). Techniques developed in the Near East made their way back to Northern Europe around the time General Pitt-Rivers was working to revolutionize archaeological practice, and modern field recording began in the United Kingdom (Adkins and Adkins 1989; Piggott 1965; Trigger 1989).

Pitt-Rivers' recording was meticulous and formed the core of his work. He documented what he was destroying through excavation and believed the complete record should be published so that other archaeologists would be able to ask their own questions of the data (Trigger 1989: 199). That record was also primarily visual for the first time. Piggott discusses how Pitt-Rivers chose to create illustrations that were "... not ancillary, but the main matter of the reports, the text being a comment on the plates ... A dictum attributed to Pitt-Rivers—'Describe your illustrations, do not illustrate your descriptions'" (Piggott 1965: 174). Pitt-Rivers understood the power of the illustration to communicate, but while he created effective plan drawings, his section drawings were more problematic. Though systematized, his decision to dig in spits rather than layers meant he was unable to clearly understand his stratigraphic relationships throughout his career (Bowden 1991: 94).

In addition, Pitt-Rivers sometimes abandoned detailed stratigraphic section drawings for what is described as an "average section," where finds were distributed through a general profile, which further hindered his attempts at establishing dating chronologies ([FIGURE 2](#)) (Bowden 1991: 128).

Piggott's own contribution to field drawing is entirely neglected in his survey of archaeological drawing. Piggott's drawings show the synthesis and understanding of the artists with whom he worked, like Heywood Sumner and Robert Gurd, and careful study of the work of Aubrey, Stukeley, and Pitt-Rivers. He retains the arts and crafts style in his lettering, and his work is highly detailed and precise, while maintaining Gurd's "well balanced, calm and easy to read" aesthetic (Goddard 2000: 8). His plan of the cairn at Cairnpapple Hill is an exemplar of this style (Piggott 1947–1948). The



**Figure 1.** John Aubrey's famous drawing of Avebury, c. 1675. This drawing is an orthographic projection in plan view, which archaeologists continue to use today.

information is complex, but the annotation never obscures the plan itself: it is visually easy to separate the cairn and kerbstones from the larger henge, and the above-ground features from the areas where excavation took place (FIGURE 3).

Clearly, the twentieth century had artists, draftspersons, and archaeologists all forming a modern understanding of field recording in the United Kingdom, but the image long held as the standard of perfection in archaeological recording, combining both clarity and aesthetic, is Mortimer Wheeler's "Section from Segontium" from 1922 (FIGURE 4). More than 30 years apart, Lesley and Roy Adkins, and Stuart Piggott agree on the importance of this single drawing. For Adkins and Akins:

The modern approach to illustration, with the conscious realization that the purpose of the illustration is to convey not only information but also an interpretation of that information ... irrespective of differing styles and approaches, the best archaeological illustrations have been based on the principles so clearly demonstrated in that drawing. (1989: 5)

These concepts are familiar to us. Piggott, too, found common ground in purpose and illustration for archaeology:

It stands for, and was among the most immediate founders of a tradition which British archaeological draftsmen have in the main followed since the 1920s. It was a statement of a new code, a relational model presenting the excavator's interpretation clearly and unhesitatingly; the sentence spoken with inflexions of authority; the drawing of a man who had made up his mind. (1965: 175)

Edward Harris comments on Piggott's aesthetic evaluation of Wheeler's drawing with a further practical explanation: "it may be suggested that the drawing broke with tradition in

having the interfaces between strata properly defined ... he also began to number the layers of soil in sections and in the records, which was definitely a landmark decision" (1989: 11).

The statement by Adkins and Adkins in 1989, that a drawing created in 1922 still epitomized the modern approach to archaeological illustration, is extraordinary. At a time when the discipline was entering the digital age, Wheeler's effort was deemed just as powerful as when it was first published (Balm 2015; McAnany and Hodder 2009). Though archaeological drawing conventions in the United Kingdom have changed since Wheeler's section was published, that it remains influential attests to a strong intellectual tradition and the establishment of a particular method of knowledge production that is still recognizable to current practice.

Though Wheeler's iconic illustration style, with clear lines dividing strata, has come to typify British archaeological recording, Geoff Carver (2010) contrasts this style with the more schematic drawings of Gerard Bersu. Carver suggests that there is a danger in employing an overly scientific aesthetic, lest we be "seduced by the fantasy of objective science" (2010: 119). Nessa Leibhamer also experimented with a more artistic aesthetic at Çatalhöyük (2000).

Throughout the history of archaeological field drawing, there have been dramatic changes in style, in the information that the illustrator was trying to convey through drawings, and in the relative importance placed on communication through illustration. A retrospective review of these changes through specific examples reveals larger disciplinary shifts in how archaeological deposition was understood, aesthetic

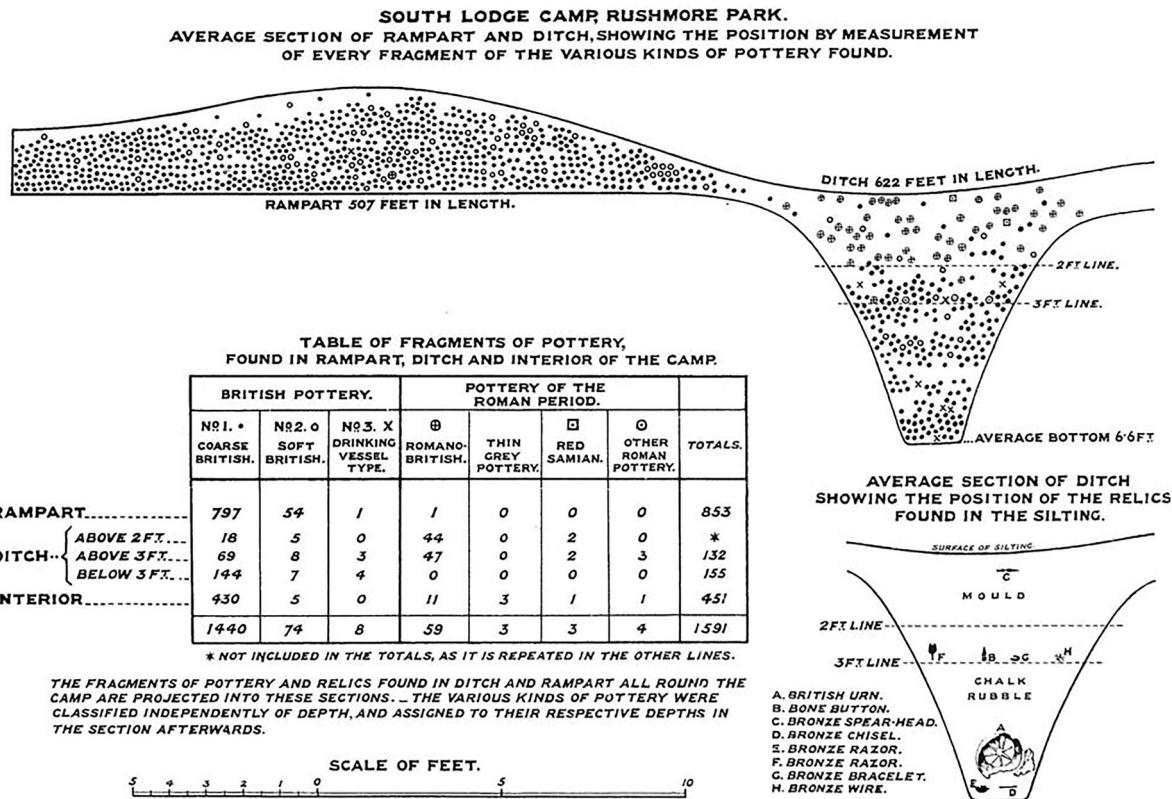


Figure 2. Section drawing by Pitt-Rivers (1898), showing the use of "average sections".

considerations showing the influence of the larger visual culture inhabited by the archaeologist, and how the individual archaeologist perceived or failed to perceive the archaeological record. Yet even with many of these historic examples, it is often difficult to determine exact authorship, as many directors employed site artists. Some of the drawings were probably composite efforts by multiple people and the product of several drafts, perhaps sketched in the field and inked off-site, or drawn at a later time from memory. In his *Archaeology from the Earth*, Wheeler describes the importance of collaborating with draftspersons on plans ([1956] 2004: 144–146), though his published sections bear his initials alone. Further, these published illustrations were a final product, meant to communicate specific archaeological interpretations to a wider audience. Though it is outside the scope of this article, it would be instructive to mine field notebooks and other archival materials from their respective projects to understand how sketches figured into these finished interpretations.

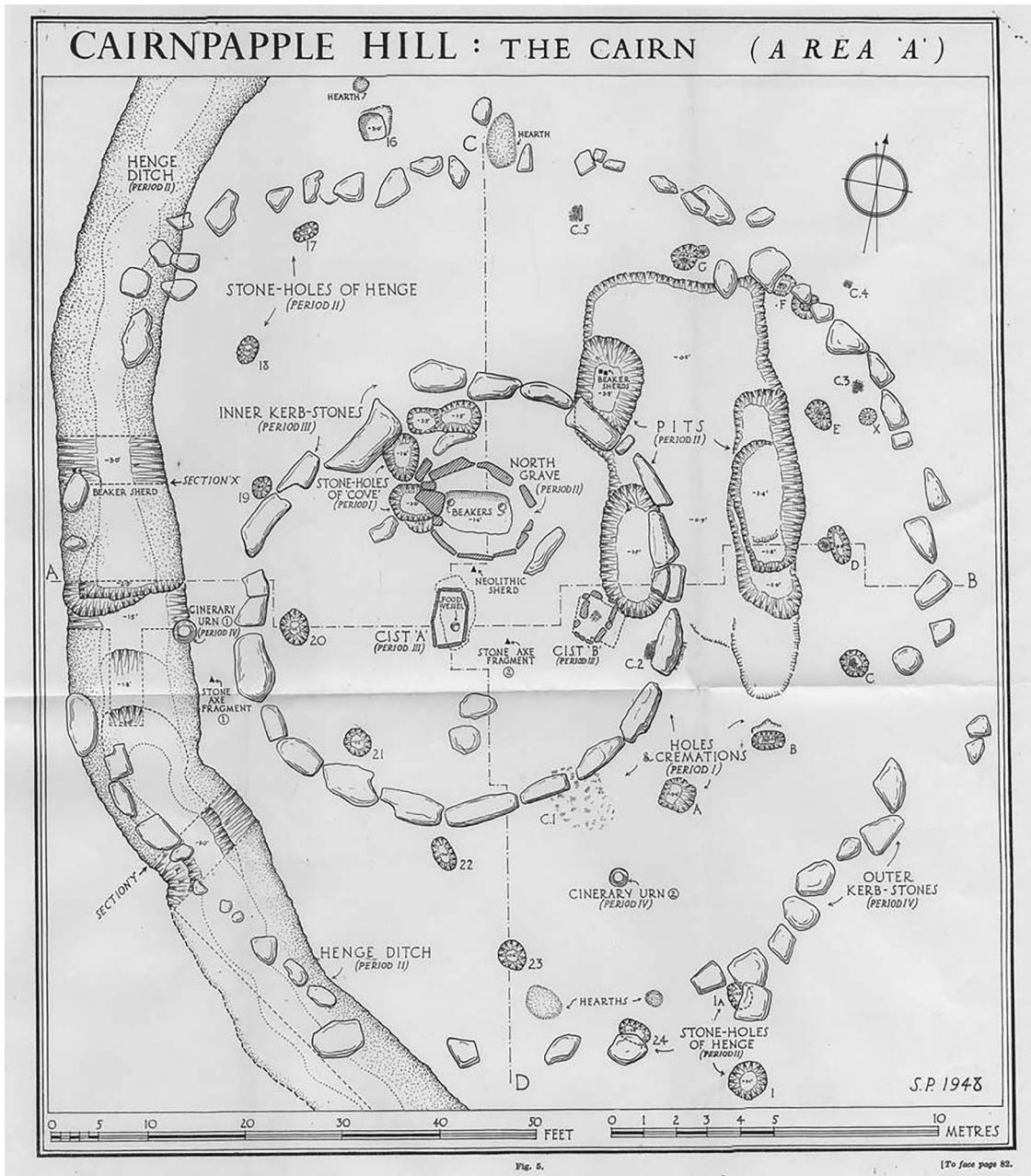
These vagaries of practice remain an issue in evaluating the place of drawing in archaeological recording, even as archaeological illustration shifts to digital tools. Authorship, relative skill, and an understanding of craft in archaeological practice are certainly underlying concerns in the production of interpretive visual media. By acknowledging the history of illustration's place in knowledge construction and communication of the archaeological record, we are better positioned to review the impact of digital tools in interpreting and transmitting this same information.

### Current Conventions in Field Drawing

While we have traced the development of a few examples within the United Kingdom, archaeological field drawing has a diverse, disparate lineage. Though there is some overlap,

field drawing currently can be divided into three general categories: plan drawing of areal excavation, section drawing, and larger-scale illustrations of landscape. There is still relatively little discussion of current field drawing in academic literature. Some of this scant discussion delves into drawing as a metaphorical encounter with the past. For example, Lesley McFadyen (2011) describes the process of drawing a Bronze Age ring ditch in plan and section, suggesting that drawing archaeology is a temporal experience wherein a hard pencil line inscribes the space between the past and a potential future. Further, many published, historic examples of field illustrations involve landscapes and sections, whereas the greatest divergence between current methodologies has been in depictions of areal excavation. Landscape illustration is increasingly fully digital (though exceptions are discussed by Flexner [2009]) with plan and section drawing trailing behind. The introduction of waterproof and dimensionally stable drafting films like permatrace made field drawings more durable (Adkins and Adkins 1989: 11; Hawker 2001: 47), and calculators and electronic distance measurers (EDMs) to aid the recording of distances and levels (Hawker 2001: 46), were, until recently, the newest technologies used to create them.

Present practice in drawing areal representations of archaeological deposits is globally fragmented, with only a few commonalities. Cătălin Pavel's (2010) survey of archaeological recording systems reveals this diversity through the affordances of context sheets: whether there is space for free-drawing, if there is a circumscribed space denoting a one by one meter square, directions regarding scale, indication of magnetic north, or if the expected sketch would be performed in a notebook with color-coding (Masur et al. 2014). With the emergence of digital field techniques, increased availability of unpublished fieldwork reports



**Figure 3.** Plan drawing of the cairn at Cairnpapple Hill. Reproduced from Piggott (1947–1948: 82).

(commonly referred to as archaeological gray literature) such as site reports hosted online, and connectivity of communities of practice through social media, it is possible to discuss these differing methods of representation in archaeology and speculate regarding the potential homogenization of archaeological visualization. Field drawing is a medium in transition; we situate this transition through a discussion of enduring analog methods alongside emerging digital techniques.

Areal field recording of archaeological remains during excavation is done in a variety of ways. Steve Roskams (2001) lists several types of site planning in current use by archaeologists, including top planning (or single-level planning), phase planning, and single-context planning. Top planning simply records everything seen in the unit at an arbitrary level, irrespective of what the unit contains. It is akin to taking a snapshot of the unit, and then determining the relationships during post-excavation. Phase planning records all visible contexts considered contemporaneous. Single-context planning records each context separately, so

that information for that context is grouped together and the relationships confirmed during post-excavation. Once a context is defined, it is then planned and excavated. Single-context planning is perhaps the greatest rupture in the continuum of archaeological field illustration.

While most recording systems are based on reproducing the presence of material remains and derive from stratigraphic recording in geology, single-context planning depicts abstracted events or concepts in the archaeological record (Harris 1989). These abstracted events include negative cut features; though there are indications of this cut present in both the subsequent fill and the previous deposit that the cut was dug into, it is not tangible. These forms of negative evidence are critical to the interpretation of archaeological stratigraphy, and are either not shown or are confusingly illustrated in top or composite plans (Harris 1989). For example, the single-context plan (from the Origins of Doha and Qatar Project) shown (FIGURE 5) demonstrates a negative event: a cut made from the removal of stones from a wall.

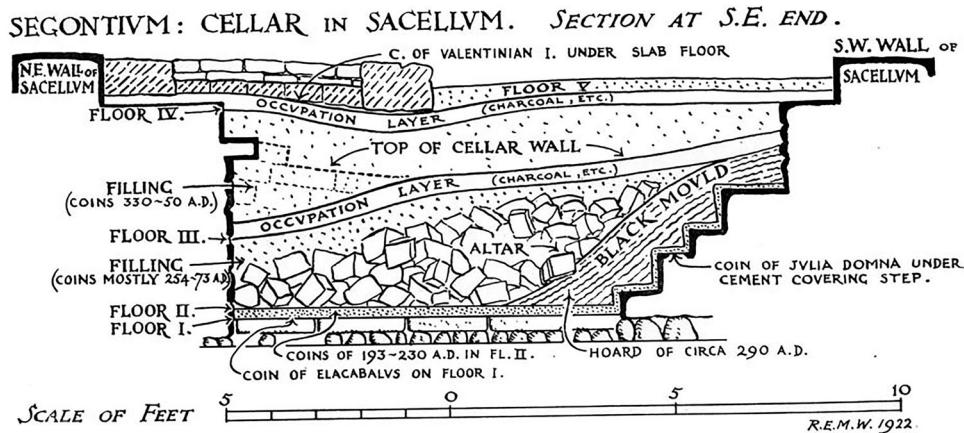


Fig. 17.

**Figure 4.** Drawing by Mortimer Wheeler of a section across the cellar in Sacellum at Segontium.

This plan was originally drawn on permatape and can be overlaid with other plans of the area to create a temporal sequence that mirrors the interpretation of the archaeological record. The photograph (FIGURE 6) of the same context has been annotated to show how the plan represents this cut.

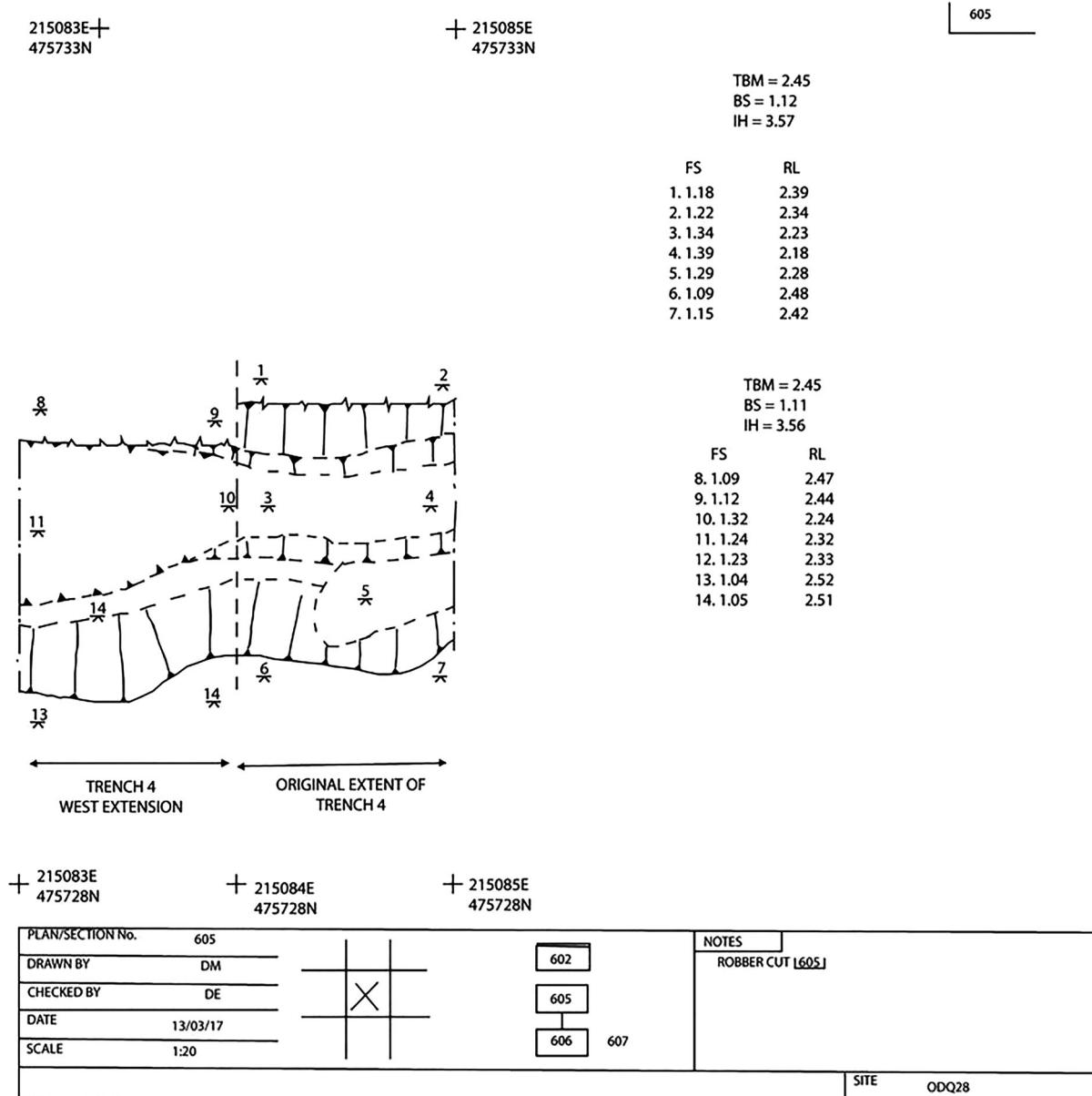
Harris (1989) cites several examples of the use of the Harris Matrix to phase and interpret archaeological sites, including shell midden sites in British Columbia and the Hoko River cave site in Oregon. This atomizing of archaeological deposits as discrete entities and their reassembly into a stratigraphic sequence is more akin to creating a stop-motion animation of archaeological deposition than a holistic rendering of material remains (Leibhammer 2000). There are several debates regarding the efficacy of each recording system (Adkins and Adkins 1989; Harris 1989; Roskams 2001) and our observations of the differences in plan view drawing afforded by various field recording systems stem from an understanding of the contrast between British single-context and Americanist approaches. Though there is not enough space to expand on these debates, we encourage reflexive consideration of field drawing in any recording system.

In contrast to the varied modes of plan view drawing, recording of sections has been the traditional means of establishing the stratigraphy of a site since they were first adapted from geological stratigraphy in the nineteenth century, and as a result have remained relatively static. The use of sections varies geographically, with their inscribed use in much of the Americanist tradition through balks and 1 × 1 meter excavation units, and the reduction of their use in conjunction with single-context recording (Harris 1989). During the 1960s, Barker's advocacy of the open-area system meant archaeologists were no longer creating the balks associated with older forms of recording, and were therefore working with large vertical planes. Stratigraphic relationships could then be established using single-context recording in conjunction with the Harris Matrix without the reliance on sections. If sections are desired to illustrate the archaeological sequence later, they can be reconstructed in great detail along any axis from areal single-context plans (Harward 2012).

Landscape, plan, and section drawings have all been incorporated into formal systems of recording, yet we must briefly discuss field sketches, even as they are the most marginal and rapidly disappearing form of archaeological recording. Most recording forms offer a place to draw archaeological deposits,

though the degree of formality of these drawings varies widely. The Origins of Doha and Qatar Project context sheet shown is modeled on the Museum of London system and provides almost a full page for sketching (FIGURE 7). This particular sketch considerably disambiguates several contexts that can be difficult to discern in the photograph of the context (FIGURE 8). In such sketches, excavators are expected to reproduce the single-context plan, as well as to include a sketch section for fills or cuts; some excavators include small isometric sketches or multi-context plans to show the location of artifacts or other important contextual information (FIGURE 9). The attending photographic record could not be easily annotated to show the relationships identified during excavation, particularly those that are not tangible. These sketches on context sheets are incredibly useful, and can be quickly referenced to inform later inquiries into the stratigraphy of the context. They are also perhaps the most direct parallel to the architectural survey sketch, described as "both a record and a statement of visual inquiry" (Edwards 2008: 17). The links between drawing in architecture and archaeology have been productively explored by Alessandro Zambelli (2013), and will be expanded below.

Areal, section, and landscape drawings all use some sort of convention, agreed-upon standards, and formatting used across all drawings in a particular project, what Helen Wickstead refers to as "Collective Drawing" (2008: 21). The Archaeological Site Manual for the Museum of London Archaeology Service contains guidance for areal, section, and elevation drawings (Westman 1994), as does the Manual of Archaeological Field Drawing, published by RESCUE: The British Archaeological Trust (Hawker 2001). Yet assuming a shared knowledge of conventions between recording traditions remains risky; Matt Edgeworth (2012) reproduces several annotated field sketches to reveal knowledge production and changing interpretation in archaeology, but provides no key for those unfamiliar with these drawing standards. British archaeologists would recognize the hachures and dot-dash conventions in the drawing to indicate slope and an arbitrary boundary, but this might be lost on a global audience. Complexities regarding drawing conventions and the difficulty of transcribing these standards to digital media (Hopkinson and Winters 2003) and the move toward digital field recording may result in either the homogenization of conventions or the elimination of field drawing altogether.

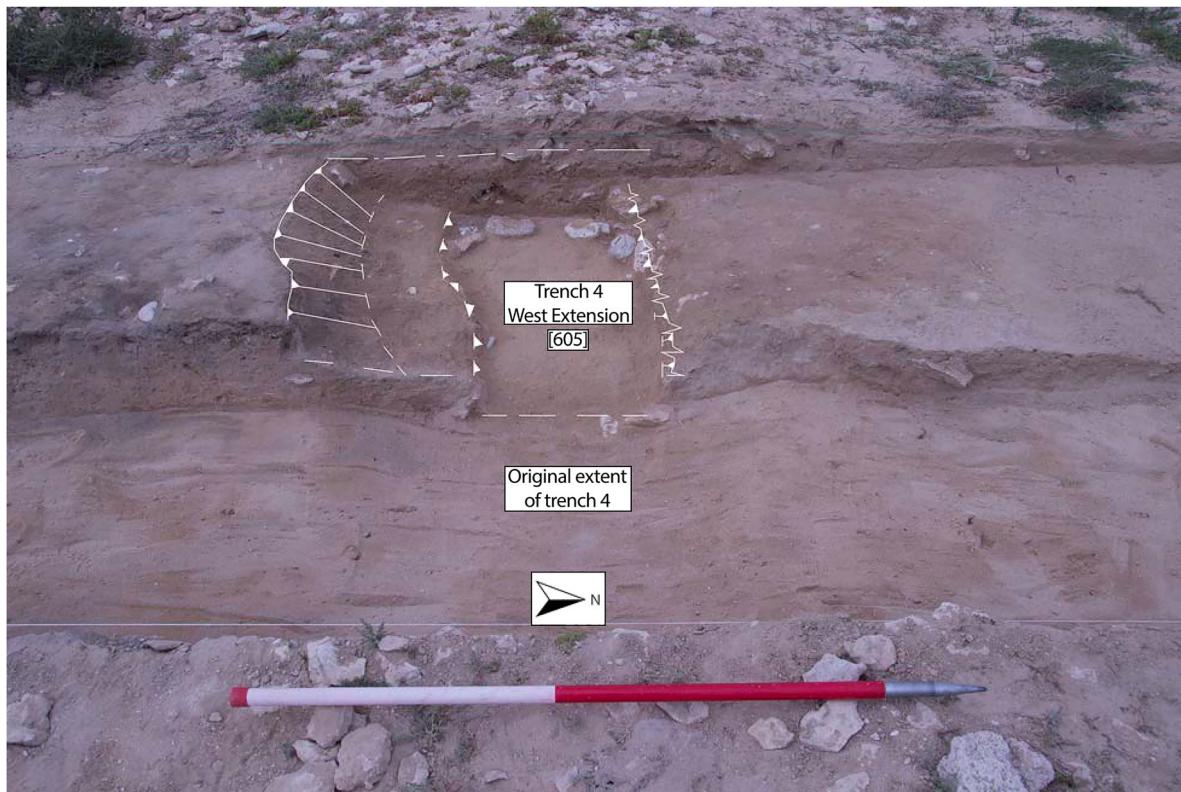


**Figure 5.** Single-context plan on permatrace of the cut made when stones of a wall were removed by past occupants. Drawn by David Mackie and digitized for publication by Colleen Morgan.

Though there is a wide range of conventions across regional traditions and variation in the relative utility of drawings and the ability to translate these into meaningful interpretations of archaeological deposition, drawing has persisted in archaeological practice. In regional traditions that do not disambiguate between archaeological deposits, that excavate in arbitrary levels, or exclusively use top plans, the benefit of drawing by hand may be obscured and accuracy valorized above all other considerations. For stratigraphic excavation, drawing by hand invokes an intimate interaction with the materiality of the archaeological record, forcing the archaeologist to observe stratigraphic relationships. As William Caraher states, “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” (2016: 435–436). None of this necessarily precludes born-digital approaches; our review of the differences between regional traditions, different forms of recording, and the advantages of hand drawing can better inform the careful integration of digital tools.

### Digital Field Drawing

Digital field drawing incorporates the capture of primary field data using digital tools, the processing of field data using digital technologies, and the way data is communicated when created using digital means or presented in a digital format. The most common means through which digital technology has replaced analog field drawing, and one of the first technologies to be borrowed from another discipline, is digital survey. This includes Global Positioning Systems (GPS), EDM, and the Total Station Theodolite (TST). While a GPS unit is meant to move and take readings based on the positioning data received from satellites, and is thus a new form of technology, the EDM and TST are digital replacements for analogue predecessors, namely various types of triangulation and measurement using hand-held tapes, the plane table, or the traditional theodolite (Adkins and Adkins 1989; Collis 2001). All create vector-based spatial information, forming a field drawing that is born digital, and therefore considered primary data. As these technologies have largely replaced their analog predecessors, digital vector data consequently



**Figure 6.** Photograph of the robbed out wall depicted in Figure 5. Photograph taken by David Mackie. Later annotations added by Colleen Morgan for publication to demonstrate relatedness to the single-context plan in Figure 5.

forms the backbone of the spatial record for an archaeological survey or excavation. While these technologies are common and proven, they are not yet universal.

Alongside these early born-digital recording methods (Wallrodt 2016), retrospective conversion of hard-copy archaeological drawings became a common practice. The term “heads-up” digitizing refers to the most typical process by which an archaeological drawing on paper is digitized, in which the drawing is scanned and imported into a drawing program at the correct scale and orientation, and then traced using a mouse or a digitizing tablet and stylus (Eiteljorg et al. 2002). Whether a current project is planning to use heads-up digitizing to create a digital archive based on a selection of field drawings, or an existing archive is being re-examined and its drawings are undergoing retrospective conversion using heads-up digitizing, the result is the same. Both are generating secondary data in digital format, which means an additional translation process is taking place. For field drawing, retrospective conversion usually involves the digitization of plans and sections using a vector-based digital drawing program. Like the forms of digital data capture used in survey and the hand-held experiments mentioned previously, these drawing programs capture information using points, lines, and polygons which are tied to *x* and *y* coordinates, with the addition of *z* coordinates for projects in three dimensions. Digitizing such drawings preserves the detail in a way that makes working with them easier, and allows the creation of simplified versions for analysis or publication in smaller or standardized formats (Hopkinson and Winters 2003). Yet these forms of retrospective digitization are slow and represent what many see as a replication of labor; consequently born-digital drawing remains the goal for many projects.

Both born-digital and retrospective conversion methods of field drawing persist, as does pencil and paper recording that is

not subsequently digitized. Since early developments in the field, portable and tablet technologies have continued to improve, and archaeologists have taken advantage of these improvements to investigate different modes of field drawing. Early experimentation with new technologies was a prominent aspect of recording at the excavations at Silchester in the UK, which used digital pens for context recording as part of the Virtual Environments for Research in Archaeology (VERA) project (Clarke and O’Riordan 2009). Though there was a profusion of experiments with digital recording (Austin 2014), streamlined field drawing was not possible until digital display technology developed sufficiently to allow work in outdoor conditions and accuracy in transcribing detail. Accordingly, much of the early history of digital data capture, especially digital field drawing, has been through one-off projects using bespoke software and experimentation with available hardware (Clarke et al. 2003; Rains 2008), although an early workflow for digital field drawing using entirely generic tools was developed with the use of the iPad by the University of Cincinnati, working at Pompeii (Wallrodt 2011, 2016). Similarly, field archaeologists at Çatalhöyük use tablets, stating that accessing 3D models and GIS to review the excavation process in the field improves the recording methodology by “facilitating the reflexive engagement of the excavator in the archaeological process” (Berggren et al. 2015).

While tablet recording continues to develop, the increasing use of structure-from-motion documentation using photography processed by software such as Agisoft PhotoScan Pro into three-dimensional models has led some archaeologists to eschew drawing as a method of archaeological recording. The Tell Akko Total Archaeology Project methodology used georeferenced orthophotos to document excavation trenches in which “highly accurate top plans are created without resorting to hand-produced documentation or other

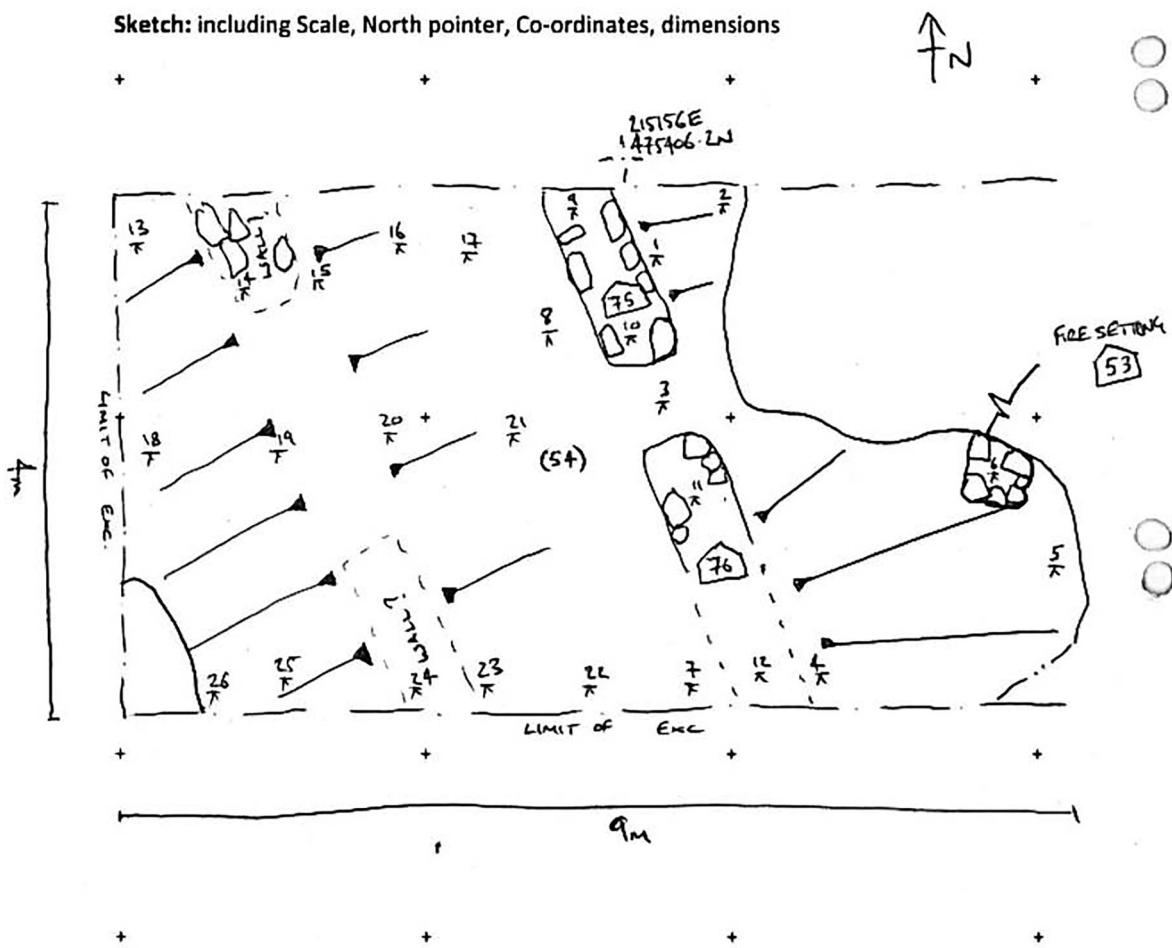
Context Number	TBM	BS 1	IH
54	1.77	1.55	3.32

If levels taken in more than one session, i.e. more than one Back Sight used, please note new BS at the appropriate place in the FS box, marking what it is clearly.

### **Mark location of levels on plan**

No.	FS	Reduced	No.	FS	Reduced	No.	FS	Reduced
1	1.08	2.24	11	1.07	2.25	21	1.12	2.20
2	1.20	2.12	12	1.04	2.28	22	1.10	2.22
3	1.12	2.20	13	1.05	2.27	23	0.98	2.34
4	1.05	2.27	14	1.02	2.30	24	1.03	2.27
5	1.21	2.11	15	1.04	2.28	25	1.20	2.12
6	1.23	2.09	16	1.11	2.21	26	1.27	2.05
7	1.06	2.26	17	1.18	2.14	27		
8	1.05	2.27	18	1.28	2.04	28		
9	1.06	2.26	19	1.11	2.21	29		
10	1.05	2.27	20	1.03	2.29	30		

**Sketch: including Scale, North pointer, Co-ordinates, dimensions**



**Figure 7.** The reverse of the Origins of Doha and Qatar context recording sheet, featuring a sketch of a wall by Ben Sharp.

forms of abstraction” (Olson et al. 2013: 254). Olson and colleagues considered these generated plans “vastly superior to the gross estimations and abstractions necessitated by hand drawing” (2013: 254).

As digital archaeological recording methods mature, there is an emphasis on the desirability of 3D information capture, citing accuracy (Olson et al. 2013), greater speed (Austin 2014), more robust data sets (Gordon et al. 2016), and a sense of improved preservation of data (Austin 2014; Roosevelt et al. 2015). There is also a perception that this will ease the transfer of data into digital databases, though this is often not the case in practice. 3D recording is usually carried out by

different practitioners than those who create databases, and unless the workflows can either be created jointly or subsequently joined up in useful ways, they may fail to connect as an integrated knowledge source. In some instances, drawing by hand is presented as a negative experience; for example, at Çatalhöyük, excavators are encouraged to trace rectified photographs on tablet screens “instead of struggling with manual drawing of an uneven surface” (Forte et al. 2015: 53). Wallrodt speaks positively about tracing photographs on touchscreens at 1:1 scale, “which removed an entire mental process from the activity” (2016: 44). Developers of digital tools espouse a general sense of impatience for drawing by



**Figure 8.** Photograph of the context sketched in Figure 7. Photograph taken by Ben Sharp.

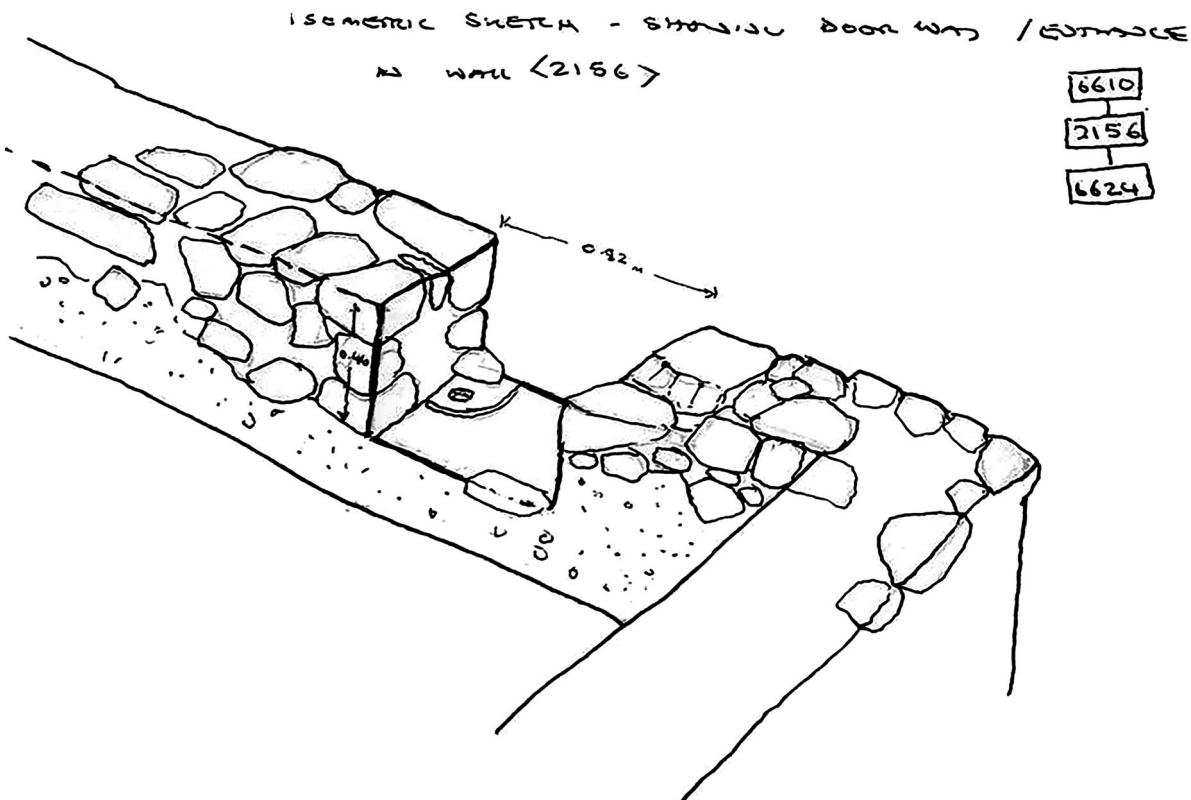
hand and a lack of awareness of why it might be an important way to understand archaeological stratigraphy, or they argue that there is no particular change or process of de-skilling in digital drawing, while at the same time celebrating what is framed as a radical change in going paperless.

Additionally, publication and archiving of 3D forms of representation lags behind (Galeazzi et al. 2016): these data are overwhelmingly represented in 2D for publication, flattening the visualization back into a traditional illustration. Data is often still treated as a one-off event in archaeology, not a living resource for ongoing interpretation. Finally, though many of these experiments in born-

digital and paperless recording describe the technology involved in detail, the relative affordances involved in using these technologies remain underexamined and untheorized.

#### Digital and Analog Drawing Considered

After scrutinizing digital and analog recording, we have found that drawing in archaeology is at a critical juncture. Though we have created a dichotomy between these methods to assess the relative affordances of each, we now seek to critically interrogate an integrated approach to preserve



**Figure 9.** Isometric sketch of a doorway by Michael House. This sketch shows the relative height of the remaining wall, the width of the doorway, and a possible fitting for the door.

the important pedagogical and cognitive functions of drawing. To understand the impact of digital drawing on archaeological methodology, it is instructive to consider how archaeologists develop and employ interpretive visual media while conducting fieldwork. In his study of professional vision, Goodwin (1994) describes students being trained to recognize archaeological remains during fieldwork in Argentina. Notably, he identifies the process of graphic representation in drawing a profile as one of the “distinctive forms of professional literacy that constitute archaeology as a profession” (1994: 612). In his example, he describes Ann, an archaeology professor, teaching Sue how to recognize and communicate changes in slope in an archaeological deposit. Sue becomes socialized into the practice of archaeology by materializing her observations through a profile drawing that transmits a relevant representation of archaeological information. Similarly, Olsson identifies field drawing as an embodied information practice (2016). He interviewed archaeologists on site who explained, “drawing allowed them to develop a deeper understanding of the area they were working in” (416). Among experienced archaeologists, drawing is at the center of an important dialectic on site. Edgeworth describes an interaction wherein one archaeologist maintained that the sketch of a section transmitted incorrect information about the sequence of deposition and, after discussion, the drawing and interpretation were changed (2003: 251–252).

Though it is a slow process, we contend that drawing by hand in the field represents an irreplaceable pedagogical tool: a collective way to construct our understanding of the archaeological record (Caraher 2016). Visual literacy and professional vision must be cultivated. As James states, “The basic experience of drawing things by hand, accurately, to scale—plans, sections, elevations, perhaps above all some artefacts—offers something unique and invaluable” (2015: 1200). Though more experienced archaeologists may be able to annotate photographs of stratigraphy, students require a multisensorial encounter to disambiguate deposits: to touch material remains, to listen to the tonal differences as the trowel scrapes surfaces, perhaps even to smell more recent deposits. The topic of 3D excavation and kinesthetic intelligence is also discussed by Paola Di Giuseppantonio Di Franco and colleagues (2012). These representations can then be reviewed by more experienced archaeologists. Drawing by hand in the field creates space for co-constructing archaeological interpretation. Archaeological reflexivity is not formed at the trowel’s edge, but in conversations at the edge of the trench, a form of knowledge production that includes discursive representation. There is some evidence that increased availability of previous site records through onsite tablets can help students and experienced archaeologists understand the archaeological record (Berggren et al. 2015; Bria and DeTore 2016) and this is an excellent use of digital media during fieldwork. Yet, for students to contribute to this database, they must understand what they are recording beyond taking a photograph and making a few annotations. Any digital surrogate for field drawing must preserve the material encounter with archaeological deposits and the space for dialog regarding collective knowledge production.

Beyond pedagogical considerations, field drawing is integral to hypothesis building in archaeology. Jonathan Bateman identifies drawing as an essential practice in archaeology—“part of a hermeneutic system that acts to both initiate and

reinforce the knowledge-creation structures of the discipline” (2006: 74). This system of knowledge creation is highlighted by Cameron Shelley (1996), a philosopher who uses visualization in archaeology as an example of Peirce’s concept of abductive reasoning in scientific theory-building. Abductive reasoning uses an initial inference to form a hypothesis around observations made during the course of scientific investigation. Archaeologists use visual abductive reasoning to recognize significant objects or patterns during survey, excavation, or artifact characterization according to a mental template formed from past experience (Shelley 1996; Wylie 2002: 101–104). Shelley describes archaeologists materializing this mental template to provide visual explanations of archaeological concepts through drawing artifacts or architectural remains. For example, Shelley cites Drury’s use of a multi-context plan of an experimentally burned reconstruction house to explain common Roman building patterns (1996). Further, he quotes Knecht, who discusses touching and drawing an artifact to understand hafting in the upper Paleolithic, adding weight to the argument that the kinesthetic encounter with archaeological materials and the translation of this encounter into visual media is important for hypothesis building (298). What remains is to determine the difference in hypothesis building between analog and digital capture and representation in field illustration in archaeology.

Though there has been an examination of the relative visual perception of archaeologists (Ashley 2013) and the value of digital and analog reconstructions (Morgan 2009; Perry 2014), there is little interrogation of the cognitive work that field illustration does in archaeology. As a proxy for understanding this cognitive work, we examine research on drawing in architecture. Architect Juhani Pallasmaa, as cited by Scheer, states, “[S]ketching and drawing are spatial and haptic exercises that fuse the external reality of space and matter and the internal reality of perception” (2014: 6). Sketching has been studied in the fields of Architecture and Design as a form of thinking, to “abstract (visually) from particulars and to typify information (that) is useful in certain kinds of problem solving”. Seven experienced architects and a student were presented with a specific design challenge and were asked to participate in a thinking aloud session in which they sketched while talking to an investigator. Researchers found that architects worked through visual arguments as they sketched, progressively understanding the space they were given to work with, then elaborating on that space to articulate a solution to the design problem (Goldschmidt 1991). While architectural design is a considerably different enterprise than archaeological recording, both involve understanding the three-dimensional organization of space, structuring that understanding, and transmitting it to others. Importantly, in-depth studies of sketching during all stages of the design process traverse the introduction of digital tools within these fields.

Later research on digital tools within design found the cognitive behavior of designers who sketch and those who use computers to be very dissimilar: on the one hand, the designer, using the traditional method of sketching, could generate more concepts and involve more cognitive actions; on the other hand, the designer using computers was limited by the affordances of the software’s tools (Won 2001) and displayed less creativity (Pan et al. 2013). Designers using

non-digital tools were more “effective in using time, conceiving the problem, producing alternative solutions and in perceiving the visual-spatial features and the organizational relations of a design in traditional media rather than digital media” (Bilda and Demirkan 2003: 49). Overall, the use of computer-based design tools introduced rigidity into their workflow and that “reinterpretation that leads to the creation of new solutions is more supported in paper-based working than digital working” (Stones and Cassidy 2010: 457). Pen-based computer drawing systems mitigated this somewhat, but there were still substantial differences between the cognitive processes of free-hand sketching and the creation of CAD representations (Lim 2003). These differences, argues Scheer, have been changing architecture profoundly, with the adoption of digital tools “transform(ing) the very nature of an architectural idea” (2014: 100).

The take-away for archaeology from this selected literature on structured sketching and the transition to digital tools in design is that there is a kind of cognitive work that is being performed while drawing, that is not easily replicated by digital tools. As drawing has persisted since the beginning of archaeological recording, remained important after the introduction of photography, is characterized as an essential mode of communication and knowledge production within archaeology, and features prominently within abductive reasoning during initial archaeological investigation, a complete abdication to digital recording should be a matter of intense consideration.

Even as digital tools are being refined for field recording in archaeology, Tim Ingold laments, “drawing is an immensely powerful tool of observation, and given also that it

combines observation and description in a single gestural movement, why has it been all but forgotten in anthropology?” (2011: 220). Ingold speculates that drawing has given way to “totalistic” ethnographic writing within anthropology, as in Geertz’s Thick Description, akin to a thickly applied oil paint that “covers over and obliterates the workings of the picture... the perfect ethnography hides the traces of its inscription, presenting a picture of the lifeworld *as if* it were arrayed, fully formed, upon a surface” (emphasis original) (2011: 222). This can be considered analogous to a structure-from-motion model used as a digital surrogate for drawing (Berggren et al. 2015). The structure-from-motion model presents a fully formed photographic lifeworld, as opposed to an abstracted pencil line on a sheet of paper. For Ingold, “the pencil is not an image-based technology, nor is the drawing an image. It is the trace of an observational gesture that follows what is going on” (2011: 225). The literature we have referenced from the fields of design and architecture reinforces this difference. To reiterate, a 3D model is not a substitution for drawing, it is another way of knowing and recording archaeological deposits and the relative affordances for each method should be fully examined.

In the end, forming rigid boundaries between by hand drawing and a completely digital visualization process may be counter-productive. A hybrid methodology that can incorporate the advantages of both digital and analog approaches is critical for developing a robust practice that preserves archaeological craft, while taking advantage of new technologies for recording. Experienced archaeologists can move between the digital and by hand methods with relative ease and with

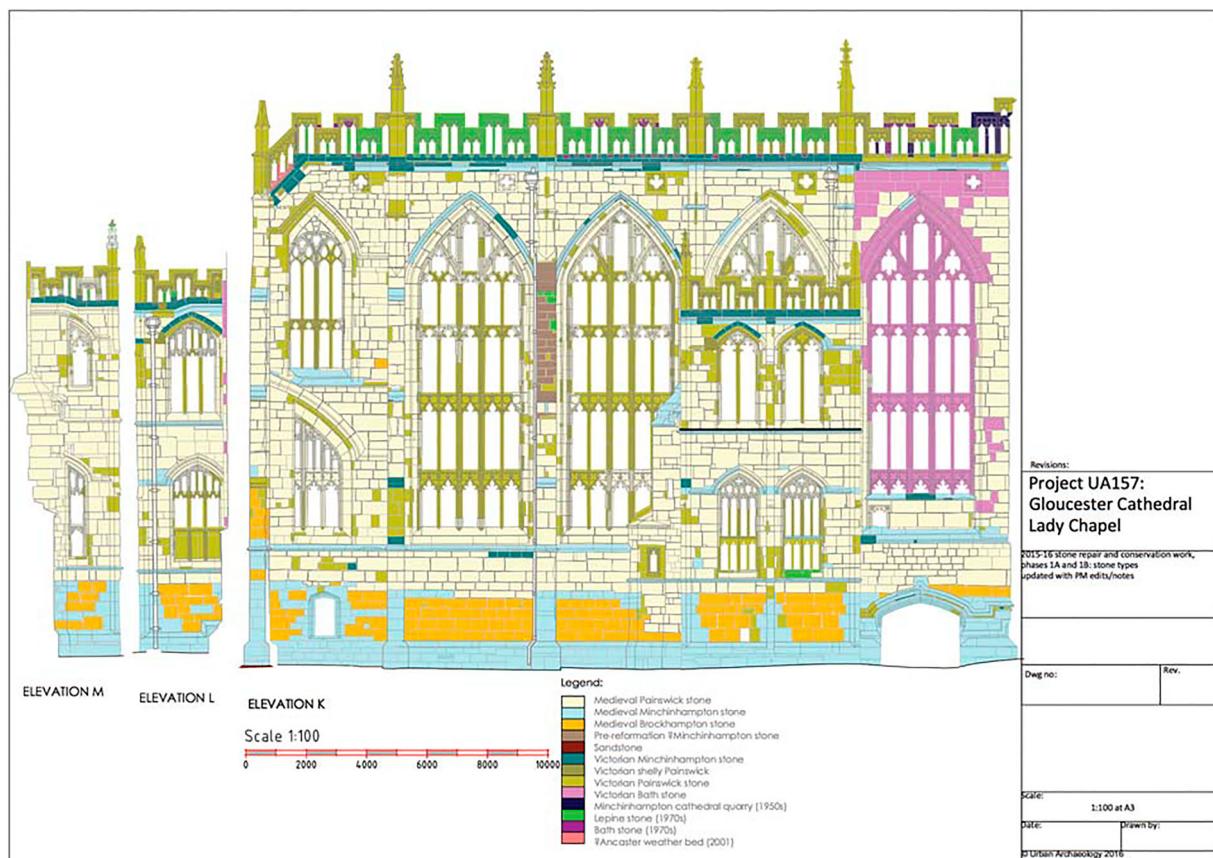


Figure 10. Chiz Harward's digital elevation of Gloucester Cathedral Lady Chapel during repair work.

excellent results. This is exemplified in the work of Chiz Harward of Urban Archaeology who drew elevations of Gloucester Cathedral Lady Chapel during repair work ([FIGURE 10](#)). He describes his workflow:

The elevations were recorded by photo rectification some years ago and the stone and detail outlines drawn in CAD by an architectural draughtsman. I have had to polygonise all the stones as that wasn't done ... and check each stone on site for errors as there were numerous problems with incorrect identification of outlines, coursing and breaks of angle etc. I've had to do several measured hand-drawn elevations of "missing" areas of elevations, and add these into the CAD. I have had to do all the stone typing by hand, annotating print outs with the stone types as it is impossible to differentiate between the stones on photos. So it is mostly done digitally, but checking by hand, it highlights the issues with trace off and underlines the combined approach where interpretation is still at the point of the pencil, but you use the tech to help where you can, but knowing its limitations. (Harward, personal communication 2017)

Harward's workflow reflects the experience of many field archaeologists when working with digital recording: the advantages of paperless are offset by the time-consuming process of documenting and transmitting a specific archaeological interpretation.

The challenge for developing digital recording is retaining the pedagogical, co-constructive, and cognitive qualities of by hand recording, while integrating the beneficial affordances of digital recording. Harward's decades of experience allow him to switch between methods to produce a highly detailed interpretive illustration. Perhaps in field schools, students could be taken through the process of recording, from paper to digital, and any tablet recording would be on a blank surface, rather than a photograph. It is important to know the effects of digital documentation on knowledge construction in archaeology. Citing the increased accuracy of tracing shapes on a rectified image misses the point of archaeological illustration: to see, understand, and interpret archaeological deposits by transcribing them on a blank surface. By the same token, creating a structure-from-motion model should not exclude drawing archaeological deposits, as the methods capture different, yet complementary information about the archaeological record. When it is not feasible to employ the full range of archaeological recording methodologies, the true expertise may be in knowing when to deploy different approaches.

## Conclusions

What began as an inquiry into the affordances of analog and digital field drawing has become a wider exploration of archaeological knowledge construction. The expansive scope of this article reveals the centrality of drawing to the archaeological process yet still leaves many questions unanswered. In their discussion of archaeology as a craft, Shanks and McGuire ask, "What kind of archaeology do we want, and will it work?" ([1996](#): 82). Any consideration of field drawing, a long-term primary means of knowledge production in archaeology, must respond to this query. Further, we must ask, what does drawing do in archaeology? What do we want drawing to be in archaeology? Wickstead expands the concept of drawing as intrinsic to archaeological practice in that they are both "arts of the trace, belonging simultaneously to past, present, and future" ([2013](#): 561).

Our brief review of illustration in British archaeology revealed the connection between understanding and communicating archaeological stratigraphy and graphic representation. It also revealed tensions within archaeological fieldwork regarding authorship, skilled labor, and the growing automation of recording methods. As Bateman notes, visual interpretations of archaeological sites are "the product of both the individual creators and the social milieu through which they are created, and as such they are not the active or direct result of decisions made by those people involved" ([2000](#): 2). The examples of illustration we provided were the work of field directors: prominent, male archaeologists in relatively powerful positions. Yet these illustrations were probably the result of consultation with workers on site. In the case of Mortimer Wheeler's famous Section from Segontium, though Tessa Verney Wheeler was not present in the Segontium archives, later she acted as Wheeler's able field assistant and had illustrations of her own in field notebooks ([Carr 2012](#)). The ambiguity surrounding authorship of historical illustrations extends to digital documentation: is the author the original excavator, the heads-up transcriber, the field director who publishes the site monograph, or even, if you read the terms and conditions, the makers of the digitization software? Finally, the benefits we have ascribed to field drawing by hand only occur if this labor is performed by each individual participating in the excavation and not a specialist illustrator or site architect.

By considering analog and digital archaeological field illustration, we do not intend to enforce a neo-luddite backlash against digital recording strategies; indeed, some of these strategies provide new insights into our understanding of the past, or can unintentionally reveal deficient excavation strategies through very detailed depictions of deposits. Both authors have substantial backgrounds and investment in digital methods in archaeological practice, and we agree with McFadyen ([2011](#)) who encourages a flexible, creative practice of making the archaeological archive. Yet we also are compelled to consider Caraher's slow archaeology as "drawing attention to archaeological practice as a meticulous, integrated craft that resists the fragmented and mechanized process of the assembly line" ([2015](#): 45), particularly when he brings this idea of craft into dialog with digital archaeology. He argues:

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 conventions of illustration to one requiring the understanding of a digital camera and software. The former is vital to the archaeological process whereas the latter is not. ([2016](#): 436)

Caraher's slow archaeology is echoed in architecture, wherein Scheer connects the process of learning to draw with values of "patience, care, and attention to detail" that are part of professionalization ([2014](#): 9).

Importantly, the integration of digital tools requires critical reflection on all interpretation and mediation, including drawing by hand. Evaluating hybrid approaches to field drawing requires understanding the benefits and affordances of digital and by hand drawing. This understanding comes from experience in the craft of archaeology—a holistic, non-alienated practice that requires great skill and creativity. Further, a craft-based archaeology guides apprentices to

mastership, and avoids separating interpretation from excavation (Shanks and McGuire 1996). With neoliberal pressures on both academic and private practice in archaeology, cultivating skill in field excavation and interpretation has been deferred in favor of inexpensive solutions such as exclusively student-based labor or community volunteer-based practice that can lead to the de-skilling of workers and the devaluation of fieldwork as primary data collection.

Digital archaeologists should understand that robust datasets rely on good practice—as is commonly stated in the field of computer science: garbage in, garbage out. Digital archaeology that seeks only to mitigate bad data collection is admirable, but wrongheaded; these technologies need to both educate and empower excavators, recognizing them as critical decision makers (Chadwick 2003). As Berggren and Hodder note, digital recording may either close the gap between excavator and interpretation, or widen it further (2003: 425). We must approach our digital surrogates with care, and ensure that we are not losing skills that are fundamental to understanding archaeology.

To conclude, medium matters. By providing this discussion of analog, early digital, and current practice in field drawing in archaeology, we seek to bring context to the current push for born-digital data and engage in a critical discussion of knowledge production at the granular level of field methodology within archaeology. Literature in design and architecture provides the background for more formal studies of cognition for understanding archaeological remains through visual recording processes, but cannot be a complete surrogate for archaeology. Future research should employ these studies within archaeology to understand the analog to digital transition in field recording strategies. To appreciate the impact of digital illustration in archaeological field methodology, the authors are shaping a program of research to compare the processes of both beginning and advanced archaeologists using digital and analog tools. Beyond determining the respective utility of each method, we hope to understand the elusive essence of archaeological recording, whether it manifests as structured abductive reasoning or as a more playful, gestural sketch.

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No potential conflict of interest was reported by the authors.

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