Extending Discourse Analysis in Archaeology: A Multimodal Approach

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Abstract

Archaeology is a highly visual discipline, reliant on observation as well as description, and consequently makes extensive use of diagrams, maps, plans, illustrations, and photography as well as textual narratives in communicating its interpretations of past material culture. If discourse analysis is to shed light on the construction of archaeological knowledge it therefore should seek to incorporate the visual alongside the textual, but at present discussion of the two modes are largely independent of each other with an emphasis on the text. A case study examines the interrelationships and interdependencies that exist between text and illustrations in archaeological grey literature and argues that a multimodal approach to knowledge creation is called for which better reflects the different modes and media used in archaeology.

Keywords

text; visualisation; multimodal; knowledge; grey literature

Archaeology and Discourse Analysis

Discourse analysis is frequently defined quite specifically in terms of the analysis of text or speech. Originally defined by Harris as "a formal method for the analysis of connected speech or writing based on its linguistic components in order to obtain new information about the text under study" (Harris 1952, 1), similar definitions are found in contributions to this volume (for example, Pereira-Fariña, Gonzalez-Perez, Martin-Rodilla, Lawrence et al, and Castiello) and elsewhere. For instance, "Discourse analysis examines patterns of language across texts and considers the relationship between language and the social and cultural contexts in which it is used." (Paltridge 2012, 2) and "… discourse analysis is a view of language at the level of text. Discourse analysis is also a view of language in use …" (Paltridge 2012, 7). Discourse analysis is often defined in terms of 'language' rather than purely text, and while this might be extended to non-linguistic forms of communication the context frequently indicates a more restrictive interpretation. For instance, Schiffrin et al (2001a, 1) categorise discourse as anything beyond the sentence, as language in use, and as a broader range of social practice which included non-linguistic and non-specific instances of language. This third category would appear to admit visual languages, for example, although the volume (Schiffrin, Tannen, and Hamilton 2001b) is fundamentally textual in outlook and while the content of the second edition of the volume (Tannen, Hamilton, and Schiffrin 2015) is significantly different, the textual emphasis across the contributions is largely unchanged. Similarly, Gee (2011, 7) describes discourse analysis as the study of language-in-use and suggests that "a Discourse is a 'dance' that exists in the abstract as a coordinated pattern of words, deeds, values, beliefs, symbols, tools, objects, times, and places" (Gee 2011, 36). While this might potentially allow non-textual representations as a form of linguistic symbolism, the emphasis throughout remains on language as text and speech. Discourse is associated with language and in turn language is restricted to text and speech.

But to what extent is archaeology a primarily textual discipline? It is common for archaeology to be described as "writing history", creating "narrative accounts of past cultures" (QAA

2014, 8), for example, which would imply the centrality of a textual approach. The close association between archaeology and text is evidenced through terminology such as the 'archaeological record', the decoration on a pot categorised as a 'grammar', the life history of an artefact described as a 'biography', and so on. The discipline of archaeology has itself been traditionally divided in textual terms, with historical archaeology focusing on 'literate' societies' and leaving 'illiterate' societies to prehistoric archaeology: what Hawkes (1954, 156–57) termed "text-aided" archaeology as opposed to "text-free" archaeology. The presence of texts in historical archaeology has seen by some as limiting the potential for archaeological theory, analysis, and interpretation, making archaeology subservient to history, a perspective leading some historical archaeologists to attempt to set texts aside and treat their studies as ahistorical (e.g., Moreland 2006, 136–37). At the same time, paradoxically, prehistoric archaeologists might bemoan the absence of texts (see, for example, Andrén 1998, 2–4; Moreland 2003, 9–13) since an archaeology without texts was seen to limit the degree to which past cultural activities could be reconstructed (Hawkes 1954, 160ff).

A textual focus is equally concerned with how archaeology and its associated knowledge is presented and communicated. The task of the archaeologist is to 'write' archaeology, from desk-based assessments and project proposals, to fieldwork with its inscriptions made in field notebooks, diaries, and context records, to the preparation of the final report and publication, and its subsequent incorporation in works of synthesis. Consequently "Writing long-form linear text remains the privileged form in which our research is shared" (Tringham and Danis 2019, 62). As Joyce argued, archaeological discourse is dialogic in nature:

> "The formation of marked genres – including site reports and more popular media, such as museum exhibits – are formalizations of specific dialogues, amenable to analysis as genres. Archaeology is a textual practice from the field through the lab and into all forms of dissemination." (Joyce 2002, 3).

This apparent textual pre-eminence in archaeology was reinforced during the structural and post-structural theoretical debates in archaeology in the 1980s and 1990s concerning text-based approaches to understanding the past. As Hodder observed, the idea that material culture was itself a text that could be 'read' was tacitly assumed in archaeology and the challenge lay not so much in the idea that artefacts could 'speak' but in understanding what they meant (Hodder 1986, 122ff; see also Hodder and Hutson 2003, 167ff). Shanks and Tilley, jointly and separately, similarly sought to treat material culture as text, arguing that material culture was

> "… a communicative medium of considerable importance for transmitting, storing and preserving social knowledge and as a symbolic medium for orientating people in their natural and social environment because of the relative permanence of material culture vis a vis speech acts. So material culture can be regarded in oral societies as a form of writing and discourse inscribed in a material medium in just the same way as words in chirographic and typographic cultures are inscribed on a page." (Shanks and Tilley 1987, 96–97; see also Shanks 1992; Tilley 1991, for example).

Although Hodder initially argued that material culture was easier to decipher than texts where the language was not known, it was quickly recognised that the relationship was not straightforward and material culture did not communicate in the same way as writing. For example, Barrett (1988) rejected the idea of an archaeological 'record' left by the past that could be 'read' like a text; instead, the past consisted of fragmentary traces of social practices whose presences and relationships could best be understood as a field of discourse. Elsewhere, Olsen remarked that

"… we come to ignore the differences between things and text: that material culture is in the world and plays a fundamentally different constitutive role for our being in this world than texts and language. Things do far more than just speak and express meanings …" (Olsen 2003, 90).

Others simply observed that the linearity associated with text made it a poor analogy for the spatial and temporal complexities of archaeological evidence (for example, Renfrew 1989, 35–36; see Preucel 2006, 138–42 for a useful overview).

From Text to Visualisation

Archaeology and text have therefore been entangled in complex practical and theoretical ways over the years, further complicated by association with Foucault's use of 'archaeology' as a means of analysing written and spoken discourse (Foucault 1989). However, although the textual analogy retains considerable influence, its pre-eminence is over-stated. An alternative perspective argues that archaeology is a "profoundly visual discipline" (James 2015, 1189); it is "an explicitly visual science … [which] has from its very beginnings developed a distinctive visual language that it has used to communicate theories, technical principles, and data" (Moser 1996, 185); a discipline in which its "illustrative traditions are central" (Moser 2001, 280) and where its everyday discourse is reliant on visual communication (J. Bateman 2006, 68). Indeed, "There can be no doubt that archaeological 'imagination' has always been visual to a large extent" (Hussain 2021, 140). Visual representations have long been a key means of archaeological communication, as seen in Carter's volumes on the Tutankhamun excavations, Flinders Petrie's *Ten Years Diggings*, or Gardner's *Ancient Athens,* for instance (see Thornton 2018). So much of archaeology is predicated on observation that visual representations can in some senses be seen as 'natural' – for example, Hope-Taylor proposed the existence of a universal visual language for archaeological evidence:

"Translate such data into words, and not only are they removed one step further from reality but also their meaning is put internationally at risk … Since we can all understand each other's drawings and photographs whatever language we happen to speak, it must always be folly to verbalize where we could visualize." (Hope-Taylor 1967, 181).

So if the visual component of archaeology is so important, why has the textual emphasis remained so dominant?

One characteristic of archaeological publications is that visual representations are often demoted to an accompanying role to the text, illustrating but otherwise contributing little to the discourse. For example, James points to what he calls "a widespread 'logocentrism' and 'iconophobia' … based on the notion that the more pictures a work has, the less seriously it is taken" (James 1997, 24). More recently, Opgenhaffen (2021, 354–55) has observed how few illustrations accompany more theoretically-inclined archaeological publications, whereas an extensively illustrated student textbook on archaeological theories, methods and practice contains no section on visualisation practice, emphasising the niche character of visualisation in archaeological communication. Pétursdóttir argues that

"… this attitude towards visual material is … anchored in a more deep-seated discrimination between word and image, between the articulated and the artistic and, more generally, in a semiotics of suspicion that has permeated the humanities and social sciences throughout the 20th century." (Pétursdóttir 2020, 102).

Part of this is bound up in a traditional distrust of images as lacking appropriate objectivity and transparency, a position inherited from logical empiricism which saw visualisation as inferior to text in a form of linguistic determinism (for example, Baigrie 1996; Giere 1996; Topper 1996). This assumes that visual representations are at best illustrations in support of the text and denies their capacity to carry information, even evidence, in their own right. The power of the visual in discourse is nevertheless important:

> ""You doubt what I say? I'll show you." And, without moving more than a few inches, I unfold in front of your eyes figures, diagrams, plates, texts, silhouettes, and then and there present things that are far away and with which some sort of two-way connection has now been established." (Latour 1990, 36).

However, in such a scenario it would clearly still be possible to see visual representations as little more than props in an argument without necessarily having evidential value.

The use of visual representations in archaeology has been seen as rather different to the standard approaches to scientific images because of the way that they do represent evidence in their own right (for example, Bueno 2016, 15; Lopes 2009; Hussain 2021). This is not to suggest that they are not selective, or indeed, that they are objective, but such selection is part of the process of archaeological knowledge construction. In the field, for example, drawings are fundamental to the process of knowledge creation:

> "The reiterative process through which site drawings are transformed into illustrations for publication gradually separates the image from the subjective interpretive process that was at the root of its inception. The conscious and unconscious decisions that were part of the image's creation become embedded more deeply within the knowledge authority structures of the discipline. The fuzzily drawn lines are sharpened and the hesitantly drawn boundaries are strengthened and defined through the repeated tracing and redrawing of the original field drawing." (J. Bateman 2006, 78).

The means by which archaeological representations achieve this evidential status is through the use of conventions: social or symbolic practices which ensure commonality of understanding and enable comparability between visualisations (see, for example, Lopes 2009, 12; Moser 2001, 268–69). The conventions determine the information to be included and frequently the way it is to be represented, creating what are effectively technical drawings of artefacts, maps, plans, stratigraphic sections, and the like. These conventions represent visual sets of rules, both tacit and explicit, which are accepted and understood by the archaeological community, if not beyond. Conventions differ between mode of visualisation (drawing, map, plan etc.) and subject (lithics, pottery, etc.), and between medium (photograph, drawing, etc.), providing different ways of seeing and representation. Such conventions

> "… work to imbue visualisations with the quality of objectivity (which brings together other qualities such as transparency, scientific-ness and facticity). This produces the impression that visualisations are showing the facts, telling it like it is, offering windows onto data." (Kennedy et al. 2016, 716).

For example, the preference in archaeological field drawings for two-dimensional presentations – either top-down (as in maps and plans) or frontal view (as in section drawings) – may have its origins in field practice (recording via the two-dimensional permatrace sheet or computer screen, for instance), but it also carries with it an implicit objectivity (although it is not) and may present an impression of control and authority through a 'god-like' perspective (Kennedy et al. 2016, 723). Even

when three-dimensional data is collected, as in structure-from-motion imaging of stratigraphic sections, they are frequently represented as two-dimensional images or tracings.

Classically, visual representations are seen to have a supporting role to the text: "… the employment of a graphical feature, photograph, map, or other representational device to elucidate, explain, or show something in a text … the illustration is meant to summarize an argument, provide a reference point, or corroborate the text." (Burdick et al. 2012, 43). The text retains priority in such a scenario: the image provides data or backing for an argument while the detail of the specific position is expressed textually. Indeed, if an illustration simply recapitulates the text, the necessity of its inclusion may legitimately be open to question (e.g., Candea 2019, 65–66). That aside, images are seen as a means of improving the readability and understandability of the text through their capacity to summarise and communicate information more economically, although their success is dependent on skilful presentation and often – ironically – on appropriate labelling and captioning. Even if they are not necessarily peripheral to the presentation of argument (c.f. Moser 1996, 186), they can appear to add a spurious level of authority by virtue of their inclusion, with their 'scientific' air of objectivity and transparency. Furthermore, there may be unrecognised, even hidden implications embedded in the visualisation which go beyond the intentions of the author – for example, drawn elements such as circles imply closure, solid lines suggest clear boundaries (Candea 2019, 76), and, of course, the range of doubts and uncertainties inherent in archaeological field drawings are frequently resolved in their final publication form. Like texts, images can also mislead

"… through the constant ambiguity between what is being figured and what is merely a convenient way to draw something. Is the distance between these two forms, their respective size, or the thickness of the line meant to be relevant, or is it merely the clearest way to arrange a picture on the page?" (Candea 2019, 76–77)

Crucially, text and image are different modes of expression, employing different languages and conventions: words and grammar producing sentences on the one hand, with shape, colour, size and space on the other, although aspects such as page layout and typography blur the distinction between the two. A consequence of these different modes is that there is always a semantic gap between text and image that is bridged through interpretation of the relationships between them. There may be a degree of functional equivalency between visual and textual arguments, but the means by which they present their information and their relationship with author and reader differ (e.g. van den Hoven 2012, 258ff).

The question remains, however, that if visual representations provide more than simply decoration or "bravura display" (Flanders 1998, 309) for the accompanying text, should they not be incorporated as part of the analysis of a discourse, rather than that analysis focussing solely on the text? Even the most basic archaeological grey literature fieldwork reports contain often substantial graphical components alongside their texts (for example, see Figure 1). Subsequently applying optical character recognition to extract the text for analytical purposes wrenches the text from that intimate relationship with the graphical and image components and restores the division between text and illustration to the state prior to the preparation of the final report, changing the interplay between text and image in the process. This raises important questions concerning the role and function of the images and graphics, and the extent to which the text in the report is reliant on or independent of them. Are the visuals in archaeological texts critical to the discourse on the page, and can a discourse analysis focused on the text alone adequately capture the knowledge represented?

Figure 1. Snapshot of the Inverkeithing Friary excavation report (Beckett 2018), excluding the cover and content pages and appendices.

Discourse Analysis and Visualisation

Understanding visualisation communication entails understanding the underlying codes – codes we may already know, at least implicitly, without necessarily knowing what we know or how we 'read' an image (Kress and van Leeuwen 2006, 32–33). Such codes provide the vehicle through which a visualisation creates meaning. Kjeldsen (2018, 79) describes visual images as providing a thick and rich, but ambiguous representation because of the range of dimensions and visual details they provide, whereas text is seen as providing unambiguous but thin information. For instance, an archaeological statement such as 'layer X is cut by layer Y' describes a stratigraphic condition in a straightforward if abstract manner, whereas a matrix diagram demonstrates this visually along with other relationships that either layer might be involved in, a section diagram shows the relationship visually along with details of the shape and extent of the cut, and a photograph may show this together with an indication of the basis for the distinction between the layers based on the colour and texture differentiation, for example, often with other contextual elements visible in the background. Whether text can legitimately be described as unambiguous is also open to question: the relative regularity and clarity of textual codes might be mistaken for a lack of ambiguity, and

differences in phrasing and shading can be used to imply uncertainty or lack of clarity in a description in much the same way as they can be represented visually.

How meaning is communicated through visual representation has been categorised in numerous ways (see summary in Engelhardt 2007, for example). For instance, Engebretsen and Weber (2018, 277–78) identify a series of 'graphic modes' within the broader set of modes or semiotic resources. These graphic modes include typography, layout, maps, diagrams, drawings, and photographs, and each offer different semiotic affordances and employ different conventions. Furthermore, each of these modes consists of a set of what they call semiotic elements, or sub-modes (for example, font, size, colour, shape, spatial arrangement, etc.), each of which in turn can be broken down further into more specific characteristics (for example, hue, saturation, luminance, texture, etc.). In an alternative approach, Drucker (2014, 65–66) categorises visualisation according to different parameters which can be combined in different ways to different ends. For example, there may be different graphical formats (maps, plans, timelines, charts, photographs, etc.), they may have different purposes (mapping, data presentation, calculation, etc.), they may have different types of content (spatial, temporal, quantitative, qualitative, interpretative, etc.), they may structure meaning differently (by analogy, through comparison, connection, in 2D, 3D, etc.), or may differ according to their disciplinary origins (geographical maps, geological sections, statistical charts, genealogical trees, etc.). In both cases, while some aspects of a visual code may be shared between different (sub)modes, others may be unique and indeed, may specifically characterise a particular visualisation method.

There is also an analytical division in terms of the methodology used to expose the workings of visual representations as meaning-making devices. On the one hand, methods may be derived from linguistic analysis, based on the notion that visualisations possess a 'grammar' which enables them to be treated analogous to texts (based on Kress and van Leeuwen 2006, for example). On the other hand, methods may be derived from information visualisation studies, itself concerned with the design of visual representations to facilitate understanding, employing graphical analytics and using visualisations to uncover relationships in other visualisations (see Kilchör and Lehmann 2021; Uggla 2021, for example).

Fundamentally, all approaches can be seen to build from three metafunctions originally defined by Halliday: ideational, interpersonal, and textual (e.g., Halliday and Matthiessen 2006, 511ff). These essentially ask what is being communicated, how the content is presented to the 'reader', and how the composition is used to create meaning. For example, Weber (2019) has usefully structured a framework of textual and graphical modes of visualisation around these three metafunctions, and the semiotic elements or sub-modes associated with visual representations are summarised in Table 1.

WHAT IS BEING COMMUNICATED?	HOW IS IT PRESENTED?	HOW IS MEANING CREATED?
• **Type of data presentation** (graph, chart, map, flowchart, network …) • **Type of data** (quantitative, qualitative …) • **Type of information** (facts, process, classification, structure, concept …)	• **Style of visualisation** (scientific, hand-drawn, cartoon, standard software template …) • **Purpose** (narrative, descriptive, explanatory, argumentative, exploratory …)	• **Grouping of units** (proximity, spatial arrangement, foreground, background …) • **Salience or emphasis** (through size, colour, shape, contrast, repetition, dynamics …)

• **Type of representation** (comparison in size, ranking, distribution, correlation, space/location change over time …) • **Type of subject** (event, action, people, objects …) • **Style** (pictorial, non-pictorial …) • **Basic semiotic resources** (lines, points, circles …) • **Visual variables used** (size, shape, colour, texture, surface, volume, duration, order, perspective …) • **What is not shown or omitted?** • **Are other visuals integrated with this one?** (embedded drawings, photos, etc.)	• **User engagement** (degree of interactivity …) • **Relationship between author/reader** (top-down, bottom-up, linear, non-linear, narrative, exploratory …) • **Distance** (small – 'showing' mode, large – 'telling' mode, viewpoint – 2D/3D, 'god' view, immersive … • **Attitude** (professional, casual, sensational, impartial, objective, subjective, factual …) • **Knowledge required** (level of visual literacy) • **Framing** (fact-based or not? Is uncertainty shown? Can different visualisations be chosen? • **Appearance of trustworthiness or reliability** • **Balance between aesthetics and ethics**	• **Framing of units** (through axes, legend, caption, text boxes, frames, connecting lines, space, colour …) • **Positioning of units** (horizontal, vertical, radial, circular, top, bottom, centre …) • **Nature of layout** (2D/3D, gridded, alignment, contrast, consistency, symmetry, balance, margin …) • **Navigation** • **Hierarchy** (information architecture, information layers …) • **Reader guidance** (defined reading path: left to right etc., no predefined path …) • **Usability** (information density and complexity, interactivity, accessibility, inclusion …) • **Causal relations?** (arrows, nodes and connectors …)

Table 1. Some of the semiotic elements or sub-modes associated with visual representations organised according to the ideational, interpersonal, and compositional metafunctions (adapted from Weber 2019, Tables 1, 2 and 3).

This analytical framework illustrates a common problem with many forms of discourse-related visualisation analysis: it is highly descriptive and consequently labour-intensive to apply since the process of recording essentially constitutes a form of entextualisation, a translation of the visual characteristics into textual description (see, for example, Jones 2021, 10ff), which tends to imply a high degree of human intervention in the process. This complexity may legitimately raise questions as to scalability of such approaches to large corpora, and in turn, how digital tools might be brought to bear on visualisation analysis.

Multimodal Discourse Analysis

Although discourse studies more generally have privileged language, virtually equating one with the other, as Rheindorf notes,

> "… if the ultimate aim of critically studying discourse is to reveal the ways in which it constitutes, maintains, and transforms social reality and relations … such logocentrism is a severe limitation: to focus only on the linguistic elements risks ignoring a significant portion of the meaning potential of texts …" (Rheindorf 2019, 93).

That said, the term 'text' has been stretched to cover other analytical objects, as in the case of archaeological approaches to material culture. Bateman et al (2017, 52) observed that anything subjected to semiotic analysis could be treated as a 'text', one effect of which was in many instances

to inappropriately associate the properties of texts with non-textual objects. Consequently, terms like 'visual language', 'visual grammar', and 'visual literacy' potentially run the risk of mis-associating textual properties with visual representations and presumes that non-textual objects perform in a similar manner to texts. This can present problems when the non-textual is categorised and described in primarily textual terms.

The logocentric nature of discourse analysis began to change with the recognition by Kress and van Leeuwen of what they called a "communicational ensemble" (2001, 111), acknowledging that meaning was created in many different ways through different modes and media coming together. Consequently, they argued, the idea that "language is the central means of representing and communicating even though there are 'extra-linguistic', 'para-linguistic' things going on as well – is simply no longer tenable, that it never really was, and certainly is not now." (Kress and van Leeuwen 2001, 111). They subsequently produced what they called a 'grammar' of images (Kress and van Leeuwen 2006) but this multimodal approach to the creation of meaning extended beyond text and images, ranging across layouts, music, gestures, video and film, soundtracks, 3D objects, artefacts, space, architecture, etc.. Kress (2010, 79) describes these multiple modes or different semiotic resources as presenting a challenge to notions of language since the different modes offer different potentials which affect the choice of modes used in specific instances of communication. Hence, for example, a multimodal analysis may involve the examination of the words and their presentation on the page in conjunction with the function and meaning of visual images, and the way the two semiotic resources are integrated with each other (e.g., O'Halloran 2004, 1). For instance, the text and image may refer to each other through cross-references in the text to the image, representations within the image of aspects of the text, and so on. In combination, therefore, they provide different possibilities for meaning-making, and further, expand what is possible to express using one or other mode alone (J. A. Bateman 2011, 17). While different modes may have specific properties uniquely associated with them, they are not necessarily restricted to them but may operate across different modes. For example, 'framing' in an image context may refer to the boundedness of the image, but it may equally refer to the layout of a text, or the divisions between architectural spaces, or the intervals in film or music (Kress and van Leeuwen 2001, 2–3).

Although multimodal analysis implies a unified multidimensional approach across all modes, this is not always the case: each mode may be analysed individually. Although this clearly cuts across the objective of multimodal analysis and hence restricts potential outcomes, it recognises that a 'true' multimodal discourse analysis is highly complex. For example, the presentation of images, graphics, words, typography, and their spatial arrangement on a page represents an intricate tapestry of interrelationships, further complicated in a digital arena with the introduction of hyperlinks, sound, animations and moving images, making the treatment of all the semiotic modes as a single entity extremely challenging. Consequently, while it may be possible to treat the verbal-visual complex as a single analytical unit, alternatively it may be feasible to separate out each mode and analyse it on its own, perhaps drawing them all together as a final step (e.g., Bednarek and Caple 2017, 9). To illustrate this, Bednarek and Caple developed a topology which allows any analysis to be positioned relative to choices about the unit of analysis and the semiotic mode (the two axes in Figure 2) (Bednarek and Caple 2017, 9–12). For example, an analysis might be monomodal, focussing on a single mode within a single text (bottom right in Figure 2), or a single mode across several texts (top right in Figure 2), potentially repeating the study examining a different mode and ultimately combining both to generate a multimodal analysis. Alternatively, an analysis might be multimodal from the outset, looking at a combination of different modes across several texts (top left in Figure 2) or within a single text (bottom left in Figure 2).
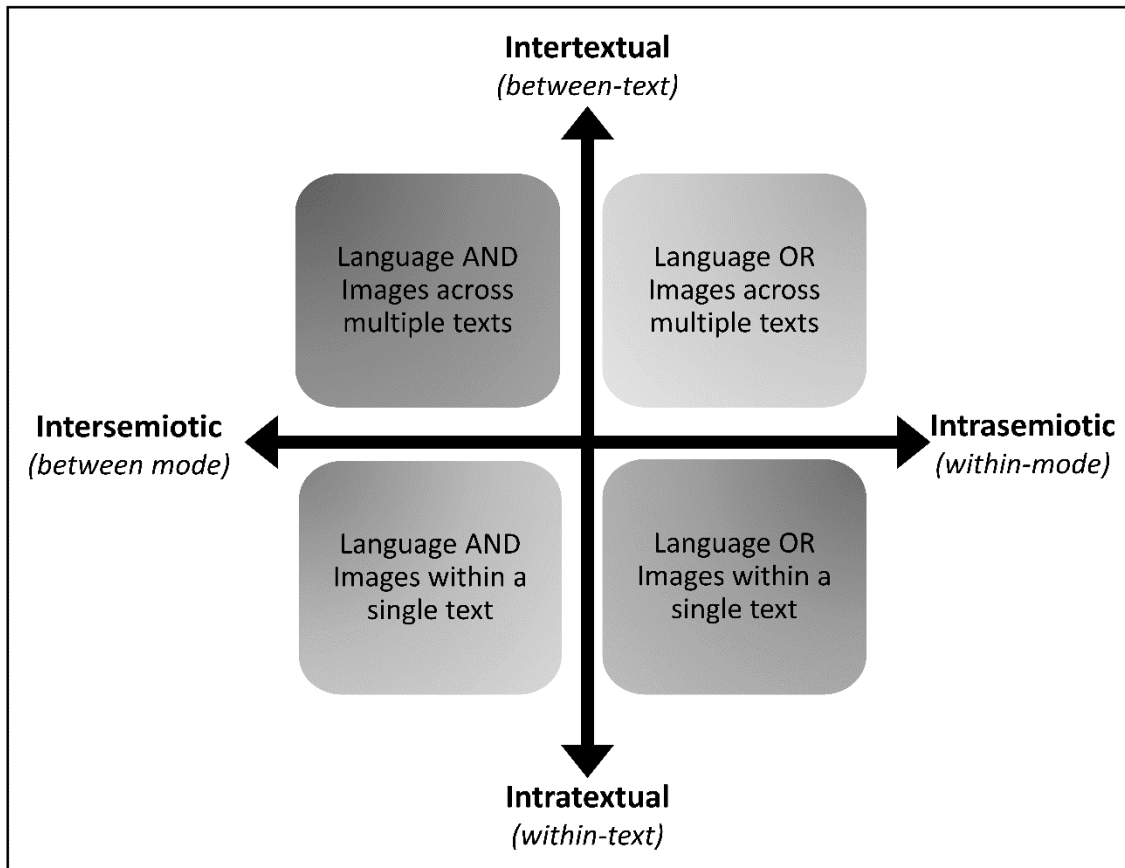
Figure 2. A topology of semiotic resources and analytical units, focusing on choices surrounding the analysis of language and/or images in texts (adapted from Bednarek and Caple 2017, Figure 1.3).

Multimodal Analysis and Archaeological Discourse

Archaeological scholarship on the written text itself has been primarily monomodal, focussing on the textual component and saying little about other means of communication that can be used in conjunction with text. One of the most extensive discussions of archaeology and text is that by Lucas (2019), a volume which itself only contains one figure (and hence reinforces Opgenhaffen's (2021, 354–55) observation about the lack of illustration in such texts). Lucas' discussion of the role of text in archaeological knowledge production says nothing about visual representation as a contributing factor, although it is interesting to consider the relationship and role of his figure illustrating the Folkton Drums in relation to the accompanying textual discussion of the drums (Lucas 2019, 147–49). By way of comparison, Fagan (2016) briefly refers to illustrations in a book that otherwise focuses on text, although Connah (2010) includes a full chapter on visual explanation in his book on writing in archaeology. Overall, however, there is only limited consideration of the multimodal nature of the writing process in archaeology.

There is a considerable body of scholarship looking at different aspects of the nature and role of visualisation in archaeology, in addition to the manuals and guides defining methods and conventions (for example, Adkins and Adkins 2009). There are discussions of analog and digital field drawing (e.g. J. Bateman 2006; Morgan and Wright 2018; Morgan et al. 2021), drawings and visual representations (e.g. Molyneaux 1997; Moser 2014; 2001; 1996; Perry and Johnson 2014; Hussain 2021), 2D and 3D digital imagery (e.g. Frischer and Dakouri-Hild 2008; Garstki 2017), photography (e.g. Carter 2015; contributions in McFadyen and Hicks 2019; Morgan 2016; Shanks and Svabo 2013), mapping (e.g. Gillings, Hacigüzeller, and Lock 2019), and aerial and satellite imagery (e.g.

Hanson and Oltean 2013; Parcak 2009), as well as a range of image-related contributions to Smiles and Moser (2005), for example. There is also a vast archaeological literature on material culture discourse associated with artefacts, structures and monuments, for example, which is not considered here. Like their textual equivalents, most discussions of archaeological visualisation are primarily monomodal and focus on the particular type of visual representation concerned and say relatively little about the relationship of that mode with the broader context in which it may be reproduced. Some exceptions to this include, for example, Morgan's study of photography at Çatalhöyük with its use of framing and semiotic codes (Morgan 2016), Baird's analysis of photography at Dura Europos (Baird 2019; 2011), Hussain's comparative analysis of French and Anglophone lithic imagery (Hussain 2021), Carter's examination of the use of scales in archaeological site photography (Carter 2015), or indeed, many of the studies in McFadyen and Hicks (McFadyen and Hicks 2019). These would likely in other contexts be recognised as discourse studies wherein they primarily examine a single, if non-textual, mode. In some instances, however, they also refer to accompanying modes: for example, Carter describes how the importance of a photograph only becomes apparent from the accompanying text and comments on the arrangement of the images on the page (Carter 2015, 9). Monomodal or multimodal, much of the work represented in the archaeological discussions of visualisation provides a valuable grounding for a wider discourse-based analysis examining the way in which archaeologists integrate linguistic and non-linguistic aspects within their discourses.

Like texts, archaeological visualisations are often several steps removed from the phenomena they represent or organise: a field drawing may be one step removed, while a final publication drawing will be several steps further removed as a consequence of intervening interpretation, redrawing, and reconfiguration. The same can be said for photographs, with original images subject to subsequent enhancement, cropping, and resizing, for example. Such processes place the eventual viewer as observer at potentially some distance from the representation and the processes it has undergone. As Drucker observes: "The interpretative acts that become encoded in graphical formats may disappear from final view in the process, but they are the persistent ghosts in the visual scheme, rhetorical elements of generative artefacts." (Drucker 2014, 66).

To investigate the effects of this and examine the degree to which archaeological texts are reliant on accompanying images, maps, and diagrams for their meaning, a selection of archaeological grey literature reports can be examined. These are derived from the Archaeology Data Service Grey Literature Archive, which is particularly appropriate in this context given that the archive is increasingly being used as a corpus for discourse-style analysis and natural language processing (e.g., Richards et al. 2011, see also Wright and Evans, this volume). The example reports chosen here for the two case studies have been quasi-randomly selected; they are understood to be broadly representative of their type and their discussion should not be construed as criticism of the reports or their authors. Case Study 2 will be discussed in less detail since the focus will be on significant differences in presentation from Case Study 1, bearing in mind each are produced by different commercial archaeological organisations.

Case Study 1: Excavation Report

The Inverkeithing excavation report by Northlight Heritage (Beckett 2018) is a data structure report (DSR), a required output of any archaeological intervention in Scotland and intended to provide the basis for further analysis and archiving. The structure of a DSR broadly corresponds to the reporting requirements laid down by professional bodies (e.g., CIfA 2020b, 13–15) and consists of a narrative account of the intervention accompanied by maps, plans and diagrams as required together with lists of data. This report concerns a small-scale excavation undertaken over a period of twelve days

on the site of the former Franciscan Friary at Inverkeithing, in Fife, Scotland, in the area of what is currently a park garden. In this example, up to 40% of the main body of the report as produced (excluding the cover, contents pages, and appendices) consists of a mixture of photographs, maps, plans and section drawings (see Figure 1).

One feature that is emphasised early in the report is that this was in part a community project: 'Back in the Habit - Digging for Inverkeithing's Medieval Friary'. Many of the photographs provided in the report (see Figure 3) quite literally flesh out the brief, factual statement on community engagement and education in the text which focuses on the number of volunteers, the number of school children, and the number of visitors on the open day, together with a brief description of what the school children did on their visit. Five out of the six images show people working or training, emphasising both the active engagement and nature of work activities undertaken. In most cases, faces are hidden or obscure, providing a degree of anonymity to those depicted. While it would be difficult to argue that the images contain information crucial to the report, they offer a useful flavour of the public engagement activities and in combination with the raw numbers of participants noted in the text provide a valuable indicator of public interest for audiences such as the funders of the project. This is underlined by a number of textual visitor accounts of their memories of the site. Finally, a photograph of a number of the volunteers and staff following a day of backfilling is provided at the end of the main report. This is one of the few images where faces are clearly visible: they are presumably among the list of volunteers provided in the acknowledgements, though none are identified.

Figure 3. Inverkeithing Friary: Examples of photographs. Volunteers excavating (top left and right); School children learning (middle left and right); Volunteers training (bottom left and right) (a composite of Beckett 2018, Plates 2, 3 and 5).

A key illustration is the site plan, showing the location of buildings, trenches, and other features (Figure 4). Apart from the site's map coordinates provided in the text, and a description of its location relative to other modern contemporary streets and buildings, there are no other textual details of the location of the site provided, which underlines the significance of the site plan in conjunction with the earlier location map. The plan incorporates a standard north arrow and scale bar, and the bounding border shows the overlying map grid with coordinates, making the scale bar slightly redundant. The boxed key distinguishes the flower bed and lawns by colour (although the empty delineated area to the lower right of the plan is actually lawn but not coded as such). The excavation trenches are delineated with dot-dash lines, and provided with labels that float outside each trench, lacking connectors to link them unambiguously although the relationship is visually clear. A wall is labelled, again without a connecting line and the label itself is well-separated from its colour coded area, which may introduce some ambiguity. Correspondingly, the label referring to a projected wall line does have a connector, but the resolution is such that this might relate to the dashed line extending from the hospitium building (and otherwise unidentified), or alternatively to the faint dotted lines which link back to the wall in trench 2. Reference to the textual description in the report makes it clear that the latter applies. The interior of trenches 1 and 2 contain a series of areas bounded by dashed lines, labelled S1 to S10, whereas trench 3 contains two areas demarcated by dotted lines with numeric labels contained in square brackets. Trench 4 contains demarcated but unlabelled areas, including one that is colour coded. Given its similar treatment to the coded area within trench 2 which is labelled as a wall, the same meaning could be assumed to apply here. None of the codes used in the labels are explained in the key or elsewhere on the plan, and their meaning is only found by reference to the text: 'S' stands for sondage, the square bracketed numbers represent cuts, while the coded area in trench 4 is a partial floor surface rather than a wall. In the text itself, trench locations are identified in general terms: 'SW corner of the Friary Gardens', 'Eastern edge of the site', for example, and the locations of the sondages are described in similar terms relative to their trench. Details such as depth and contents of the trenches are entirely contained within the textual descriptions since these would overload the two-dimensional plan. This brief overview highlights the considerable degree to which the textual component and the illustration are inter-dependent. Elements are contained within each that are not common to both, while other elements are only understandable by reference from one to the other. For example, the colour code in the site plan applied to the standing buildings and to the wall and floor features in the excavation is not shown in the key provided, but reading the text it becomes clear that this is used to denote structures in general. Similarly, the shared coded representation of the structures in trenches 2 and 4 could legitimately imply both are walls, given the label in trench 2, but the text description of trench 4 indicates that this is not the case. It is clear, therefore, that ambiguities in either the text or the plan require to be resolved by reference to the other.
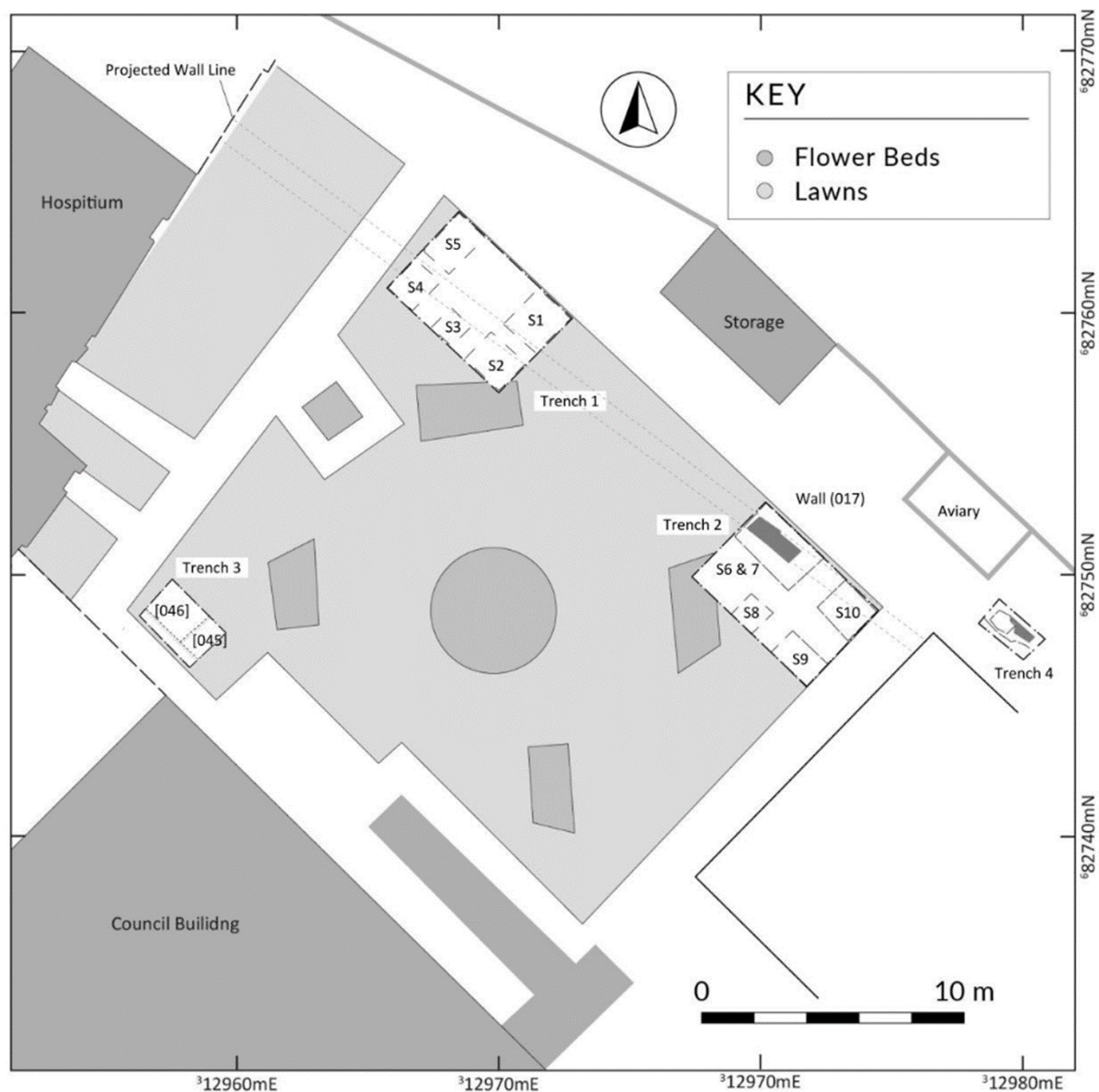
Figure 4. Inverkeithing Friary: Site plan, showing trench locations (after Beckett 2018, Figure 2).

The section drawing in Figure 5a is evidently diagrammatic in format, as indicated by the representation of grass on the ground surface and the hatching of the mortar layer (0009), for example. A key is provided to the shading used, and a scalebar is shown. Each of the layers are shown as bounded areas identified by numeric codes in brackets, but beyond the indications from the key, the nature of each of the layers is dependent on the textual description. For example, (001) and (028) are described as topsoil/landscaping overburden, while (029) is a deposit of sandy loam containing oyster shell (indicated from the key) and some stones (not apparent from the drawing). The section drawing shows that layer (010) contained stone and oyster shell, but the textual description indicates it also included green-glazed pottery and butchered animal bone. What is unclear is the extent to which the coded objects shown in the layers represent the actual position and shape of stones, charcoal, etc. or are purely representative. The stratigraphic relationships between layers are implicit within the section plan, and also specified in the context information table in the text appendices. In the text, the interpretation of the layers is separated by some distance from their description, reserved for a discussion/summary section. For example, both (029) and (009) in the section are interpreted as material left behind from the robbing out of the wall. The

markers shown labelled *b* and *b'* presumably represent the section datum line used in the creation of the original field drawing but site coordinates for these are not provided so the precise location, orientation, and height of the section is not known. It is also difficult to tie the section drawing in with the plan provided (Figure 5b), despite both relating to the same area. The plan in Figure 5b contains a north arrow, scalebar, and a key to the shading used. The wall (017) is shown in some detail, although again the presentation is diagrammatic rather than artistic since the outlines of the stones conventionally represent where stone meets the surrounding matrix rather than a 'true' representation of the stone from above. The two sondages are shown and labelled with connectors, but their numbers are not shown. It is possible that the sondage in the top left is S6 on the basis that the section drawing of S6 is SE-facing (from its caption), the S6 section shows layer (31) to the right of the wall (17), and although layer (30) is not shown, its description in the report appendix indicates that (30) is under (10), which is shown. This demonstrates that ambiguities in visual representations may be resolved by reference to other visualisations, as well as to the accompanying text. Similarly, lack of detail in the text can often be resolved through information provided in the visual representations.
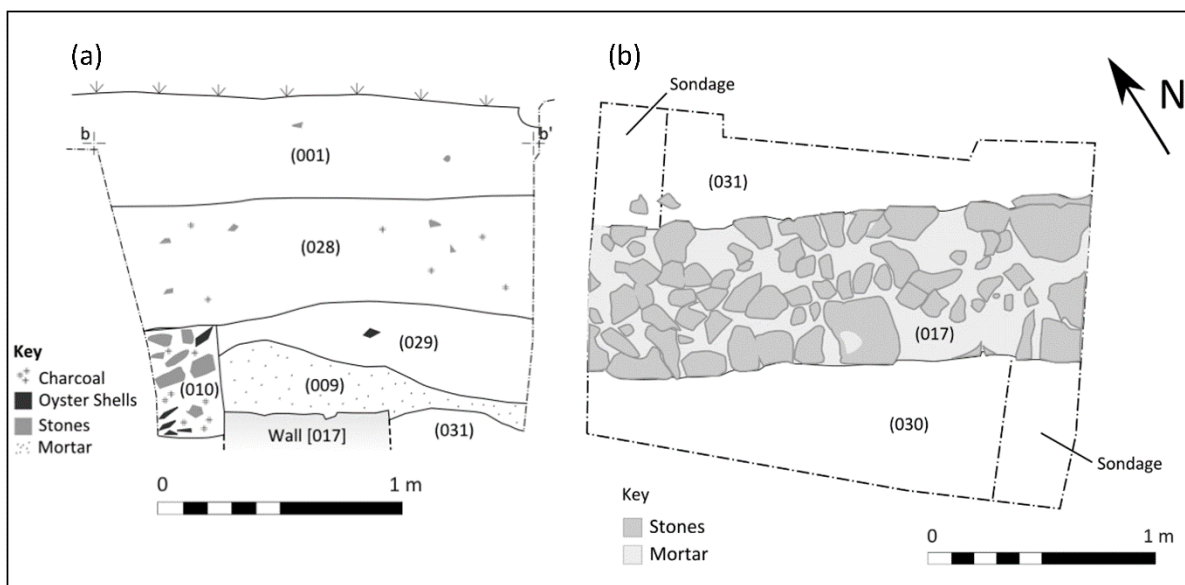

Figure 5. Inverkeithing Friary: (a) SE-facing section of Sondage 6; (b) Plan of wall within Sondage 6/7 (a composite of Beckett 2018, Figures 4 and 5).

Case Study 2: Field Evaluation and Watching Brief

The Wind Hill archaeological evaluation and watching brief report by AOC Archaeology (Walker 2020) is a report structured according to the professional standards defined for reporting field evaluations (CIfA 2020b, 13–15) and watching briefs (CIfA 2020a, 14–15). The Wind Hill evaluation was undertaken in advance of the construction of a parking area and driveway, with the objective of establishing the presence or otherwise of any archaeological remains that might be encountered during the groundworks, and, if found, evaluating their extent, preservation, date, and significance. The report consists of a number of narrative sections followed by selected maps and drawings, photographs, with context summary tables in an appendix. Almost 50% of the main body of the report (excluding the cover, contents pages, and appendices) consists of maps, plans, sections and photographs. However, there is a sharp differentiation between text and image, with all the figures and plates placed in sections at the end of the report rather than embedded in the text at appropriate locations. Alongside the report is a digital site data archive (Walker 2021) which includes

the report, a set of photographs (only 9 of which appear in the report), and low resolution scans of original site records, including drawing sheets, registers of levels, photos, and finds, together with trench records and some selected context sheets.

Figure 6 demonstrates the use of a standard template consisting of a large bounding box enclosing the drawn area and a series of small bounding boxes containing the figure number, north arrow, key, scale bar, and company logo. This could be seen as heightening an impression of professional reliability, perhaps reinforced by signs that the plan is digital rather than hand-drawn. The plan is not gridded and lacks coordinates so locational information for the site is limited to the description and national grid reference in the accompanying text. The plan provides the arrangement of test pits within the monitored area, adding more specific detail to the general locational information in the text which places test pits relative to the garden area (the proposed car park) and the proposed driveway to the south. Identification of the bounded areas beyond the monitored area is unclear from both plan and text, although Plates 1 and 8 provide some contextual information, together with additional photographs in the digital archive.
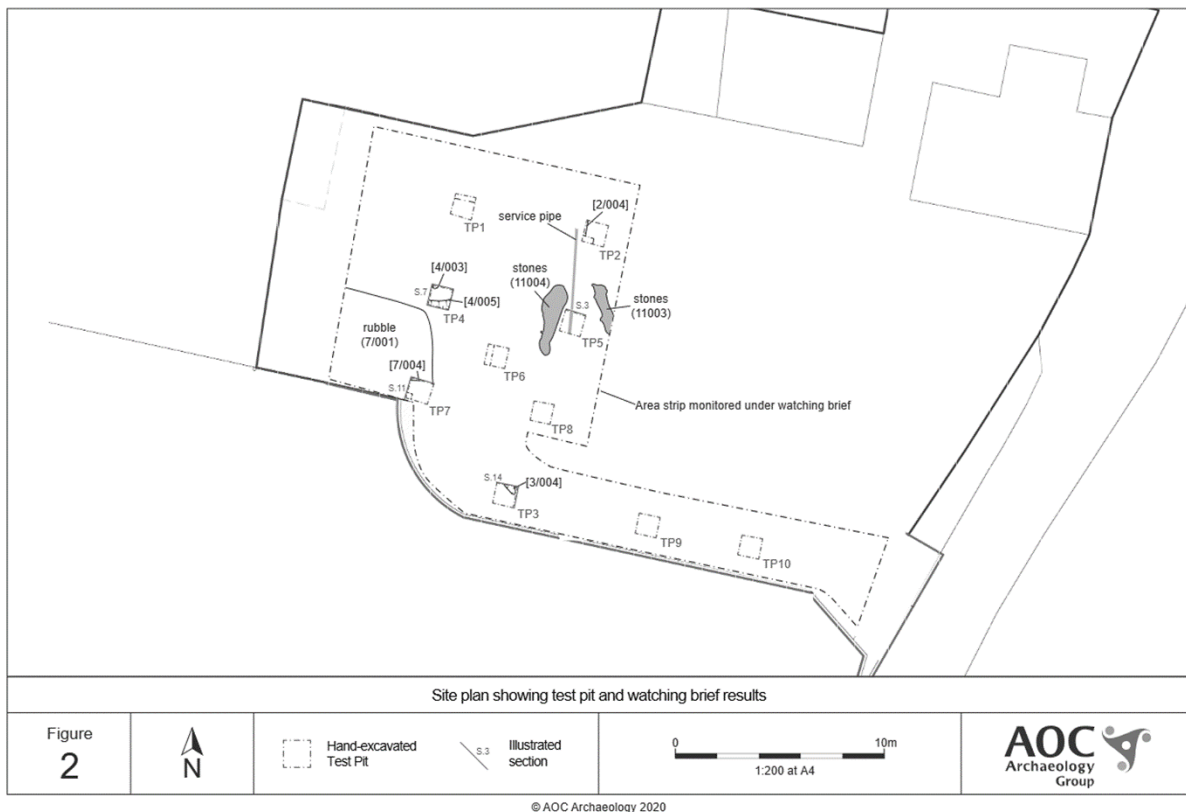

Figure 6. Wind Hill: Site plan, showing the standardised template format and test pit locations (after Walker 2020, Figure 2).

Figure 7a shows one example of a section drawing, extracted from a composite illustration of selected sections which uses the standard template incorporating scalebar, key, and logo etc.. All the layers are demarcated with firm, strong boundaries with the exception of the interfaces between 4/006, 4/002 and 4/004 which are shown with dashed lines. Apart from labels for the areas representing layers and the cardinal points at the corners of the section, areas of natural deposit and an animal burrow are also labelled. Crosses mark the location of a horizontal datum line though no locational information is provided (although the height of the datum can be calculated from the levels register in the digital archive). All the information concerning the nature of the layers visible in

the section is reliant on the accompanying text which indicates that the dashed lines represent interfaces between layers that were difficult to define clearly, and discusses the interpretation of 4/004 as a possible pit (subsequently interpreted as be root/animal disturbance) and cut 4/005 as a linear feature (thought to be modern disturbance). No distinction between layers and cuts is shown in the presentation of the context numbers, other than the use of connecting lines. The section drawing itself is a simplified, summary diagram of what was recorded in the field: reference to the archived field drawing (see Figure 7b) shows the presence of annotations and the representation of stones in the sections, together with the location of pottery, marked as a strong black line in 4/006 to the left of the animal burrow and identified as glazed post-medieval pottery in the archived record (Walker 2021). The interface between 4/001 and 4/006 is shown as a firm boundary in the final drawing but is evidently a dashed line in the field drawing, and is noted as a diffuse horizon in the archive record (Walker 2021). This example highlights not only the interrelationship of illustration and text but also the relationship between report and archive, in the way that it sheds light on details in the field records that do not make it through into the final report as a consequence of decisions made during the post-excavation process which are only revealed by virtue of access to the digital archive.
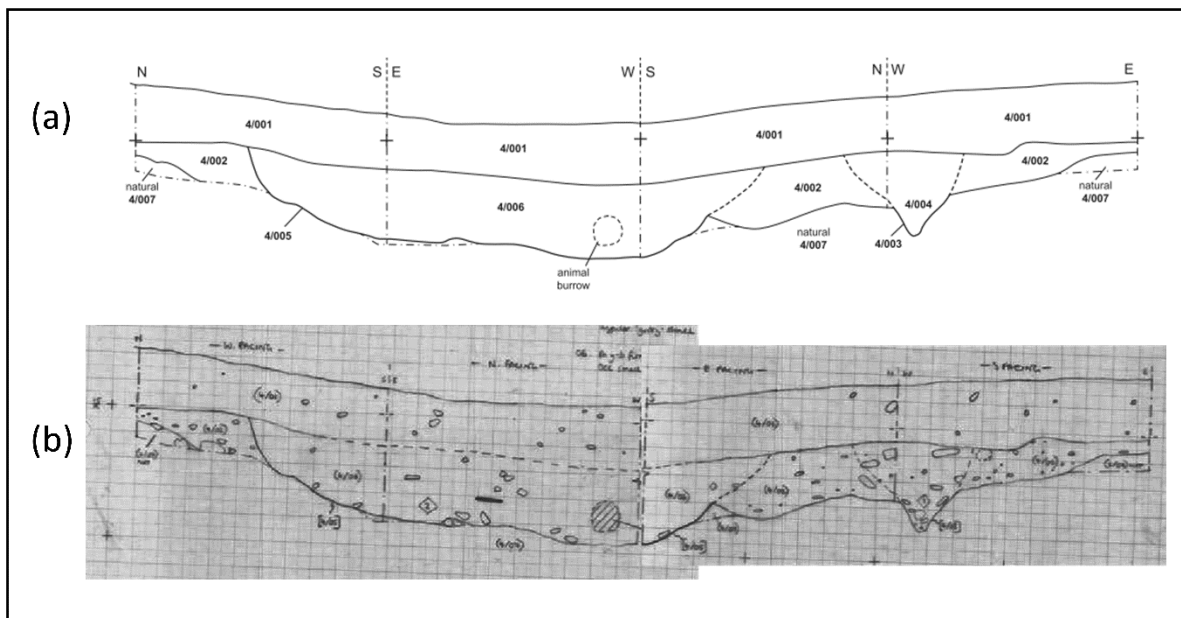

Figure 7. Wind Hill: (a) Final section drawing for test pit 4 (extracted from Walker 2020, Figure 3); (b) Field drawing of test pit 4 section (reconstructed from Walker 2021, drawing sheet 4).

These two case studies underline the inter-relationships between visual representation and textual description and interpretation in archaeological reports. At times, the visual expands on what is included in the text, at other times it simply illustrates what the text says. On other occasions, the text explains what the visual is showing, and in others again, the text and visual(s) interact to resolve questions about both. Other reports will not necessarily share the same ambiguities or the same sets of relationships, since these are in part related to convention, organisational and individual custom, and circumstances surrounding the archaeological intervention concerned. Again, the observations made here are not criticisms of the reports or their authors, but are derived from a close reading of the selected visual representations and their associated texts. The outcome of this overview demonstrates that, for some purposes at least, visual representations from archaeological texts cannot easily be ignored, as they do more than simply accompany the text or illustrate what is

already clear from the textual descriptions. Of course, for certain approaches – for instance, natural language processing to extract the what, where, and when of archaeological sites (for example, see Wright and Evans, this volume) – the visual representations are not required since adequate information can usually be found in the text. However, if more detailed processing of the text is undertaken to extract information about features, contexts, objects, and so on, then it is very likely that the visual representations will provide important information, both supplementing and providing new information to add to that which can be derived from the text. Seeking to understand the archaeological data, and the subsequent warrants and claims concerning a site without including consideration of the visual representations accompanying the textual report will demonstrably risk inaccuracy and error. A multimodal analysis that incorporates all the modes embedded within such archaeological reports is therefore a necessity in all but the simplest of cases.

Digital Multimodal Discourse Analysis

A multimodal analysis incorporating all the modes of communication present at the same time can be a highly complex task, a complexity compounded by the reliance on describing and categorising non-linguistic modes in textual terms. Questions about the extent to which this kind of analysis can be automated and conducted digitally with minimal human intervention have been asked for some time, largely because computers are commonly seen to be more compatible with linguistic rather than graphical forms of analysis. Optical character recognition enabled large bodies of text to be consumed digitally, while natural language processing techniques are capable of automating the annotation of texts. However, Salway (2010, 50) highlighted that "A major obstacle to the computer-based analysis of multimodal texts is the current limit on what can be achieved with automatic image and video analysis techniques, compared with text analysis.". Similarly, Thomas (2017, 2) describes illustrations as "the pictorial obstacles that computational tools come up against". The primary problem identified is that "images … cannot be treated in the same computational way as texts: they cannot be marked up, retrieved or 'mined' like words." (Thomas 2017, 2). Text is seen to be more computationally tractable because words and sequences of words form explicit meaning-bearing units, whereas visual representations have no equivalent accessible units of meaning (e.g. Salway 2010, 51–52; Kirschenbaum 2003, 145–46). As a consequence, computer-based analyses of visual representations have relied on textual descriptions of selected characteristics or the detection of words and phrases within the textual component that refer in various ways to the accompanying images. However, this approach creates a significant semantic gap between a coded description of a graphical representation and what that visualisation actually contains (and correspondingly, what a 'reader' would see). The textual characterisation is a poor substitute for the original, and further, inserts an interpretative layer incorporating a specific theoretical perspective into the analysis.

A method for automating the handling of images that has been increasingly investigated is the use of neural networks: deep learning computer systems which are capable of recognising objects and categorising images, and which can be used to automatically annotate an image collection. In supervised neural networks, a representation of the elements sought within the image dataset has to be coded or a metadata constructed in advance (Arnold and Tilton 2019, i4). To do this, either an existing training dataset which has already been labelled may be employed, or a new training dataset has to be created which entails coding a set of images in advance. In either event, a degree of manual tagging or annotation is required before being subsequently applied automatically across the larger image set via the neural network. Alternatively, in unsupervised neural networks, the algorithm discovers patterns and groupings without the need for pre-labelled data. The complexity and work entailed in creating a training dataset can be considerable (for example, Hiippala et al. 2021, 673ff), which means that most analysts employ a pre-trained neural network

and apply it to the data in question. Many of these pre-trained networks are based on the ImageNet dataset, consisting of over 14 million labelled images across over 20 thousand categories (see Crawford and Paglen 2019 for a critical overview). For example, Arnold and Tilton (2019, i10) employed an ImageNet-trained neural network on a collection of 170,000 images and were able to categorise the images on the basis of the dominant objects represented in each image. However, Wevers and Smits (2020) employed an ImageNet-trained neural network to categorise images within newspapers, but found that it did not work well on historic images. This is partly because ImageNet employs images scraped from the Internet, hence focuses on contemporary objects captured using high-resolution photography (Wevers and Smits 2020, 200). The same problem has been experienced elsewhere, for example:

> "… networks are often challenged by unknown, often pre-modern object categories or objects defamiliarized by style properties. This is mainly because detection networks were trained on real photos and therefore have never seen instances of swords, medieval clothing or objects deformed by Cubism …" (Lang and Ommer 2021, 7).

Other related problems arising with such pre-trained networks include the fact that resources such as ImageNet are primarily photographic in nature (Chávez Heras and Blanke 2021, 1155) which limits their value for other non-linguistic data, so, although Wevers and Smits were able to use their neural network to differentiate between images and illustrations, for example, their subsequent analyses focus on images alone (Wevers and Smits 2020, 197). Furthermore, images in ImageNet and other similar training datasets are labelled in terms of nouns, so although objects etc. may be detected, conceptual descriptions are not incorporated which is a limitation when it comes to understanding meaning-making. Pre-trained networks are also susceptible to the biases within the training data (see, for example, Crawford and Paglen 2019) as well as what Offert and Bell call 'perceptual bias', defined as "the difference between the assumed 'ways of seeing' of a machine vision system, our reasonable expectations regarding its way of representing the visual world, and its actual perceptual topology." (Offert and Bell 2021, 1133-1134). While Arnold and Tilton (2019) describe the use of neural networks as "distant viewing", in which the 'viewing' is undertaken by the network, Offert and Bell argue for 'close reading' of feature visualisations. Using the output images generated by the neural network in response to the inputs, rather than the input images themselves, they are able to show that the original dataset is often heavily biased towards specific, misleading, depictions. For example, the 'fence' class "not only picked up the general geometric structure of the fence but also the fact that many photos of fences in the original dataset … seem to contain people confined behind these fences ... this also means that images of people behind fences will appear more fence-like to the classifier." (Offert and Bell 2021, 1141). This underlines that algorithms do not look at an image in the way humans do: they handle images as matrices of pixel values (Wevers and Smits 2020, 196).

A fundamental problem with neural networks, however, is their lack of interpretability (c.f. Huggett 2021, 424ff; see also Offert and Bell 2021, 1135-1136). How the different layers of a neural network actually generate the identification is largely opaque, or, if examined closely, is largely uninterpretable to the human eye. A range of approaches to the interpretability of machine learning have been proposed: for example, building models that have explainability designed into them from the outset, post-hoc methods which seek to approximate the model in a way that is more easily explainable, and interactive methods which allow a clearer functioning of the model at each stage (Selbst and Barocas 2018, 1110). All have limitations built into them, whether it is over-simplifying the model to make it understandable or limiting the range of variables under consideration, for example. Hiippala (2021, 144–47) writes of the cascading risks in applying computational models,

ranging from the selection of data and its annotation, the model selected, the training choices made, and the subsequent deployment of the model, and argues that these require an understanding of the underlying assumptions at each stage, which underlines the importance of expertise spanning the humanities and computer science. In the end, however, computational models are not yet at the stage where they can meet Kirschenbaum's challenge:

> "Whereas it might be possible to imagine a pattern-matching algorithm that could distinguish between shepherds and sheep, how could a computer ever hope to recognize the difference between shepherds and, say, philosophers?" (Kirschenbaum 2003, 147).

Conclusions

A recent discussion of information-making in archaeological field reports looks at how archaeologists document their information work practices within their reports, and finds that evidence for this occurs throughout the typical report (Huvila, Sköld, and Börjesson 2021, 1120). Interestingly, the use of visual representations other than photographs as a means of documenting practice is not considered in what is primarily a textual review of report writing, essentially relying on whether or not the 'event' of drawing or photography is referred to in the narrative text rather than evidence of its presence in the report (Huvila, Sköld, and Börjesson 2021, 1113). However, they do note that most reports contain photographs which may be used to depict the context of the site and its details along with images of archaeologists at work (Huvila, Sköld, and Börjesson 2021, 1115), as also seen in the case studies discussed above. Clearly, including the different kinds of visual representations used in archaeological report – maps, plans, sections, etc. as well as photographs – in a multimodal study as discussed here would be a natural extension to this kind of work.

However, the use of discourse analysis in archaeology (including the discussion here) has, perhaps inevitably, focused on finished products: the final textual reports of archaeological interventions. If a key objective of discourse analysis is to understand archaeological knowledge creation rather than to simply enhance the ability to categorise and locate archaeological reports, then this emphasis on the end products of archaeological practice is only part of the story. Archaeological reports are constructed from the products of fieldwork: the databases, excavation diaries, textual records, plans, sections, drawings, photographs, as well as the objects themselves. It is the creation of these and the way these are subsequently incorporated into the final narrative that constitutes the process of archaeological knowledge creation. This process is broadly equivalent to the acts of translation, transduction, and transformation defined by Kress (2010, 124–30) in relation to the movement of meaning and meaning change. Translation essentially constitutes the movement of meaning from one mode to another, effectively from one 'language' to another (Kress 2010, 124). This includes the shift from image to writing, from descriptive record to drawing, for example, such as takes place during the post-excavation phase of archaeological reporting. Kress calls this 'transduction': "the re-articulation of meaning from the entities of one mode into the entities of the new mode" (Kress 2010, 125), emphasising the shift from words to visual representation or from photographic image to textual description. Kress also defines the process of 'transformation', which entails the reordering of elements in a text or other semiotic object while remaining in the same mode and without ontological change (Kress 2010, 129). For instance, using textual descriptions and interpretations from field records and incorporating them in narrative text would constitute transformation, whereas digitising a pencil field drawing would be transduction, moving from one material mode to another even whilst retaining its identity as a drawing. The same processes of translation, transduction and transformation might equally be applied to the archaeological recording of the material evidence in the first place, but such would be beyond the

scope of this chapter and would further extend the discourse analysis into speech and gesture, for example (see Edgeworth 2003; 2006; 2012, for instance). In relation to field recording, however, the work by Mickel (2015) and Sandoval (2020) on excavation diaries, Morgan et al.'s (2021) study of drawing and knowledge construction, and especially Sandoval's examination of context records and their accompanying sketches (Sandoval 2021) show how a close reading of such records can shed light on the knowledge creation process (see also Huggett 2020, 10ff). The value of a multimodal analysis is the way in which it would draw all these threads (and more) together.

In the same way that an understanding of knowledge creation in archaeology is limited by a discourse analysis focused primarily on finished texts, examinations of knowledge creation are, perhaps by definition, largely focused on creation rather than the consumption and consequent understanding of knowledge. For example, "Scholars studying multimodal discourse have mainly focused on meaning-making as the primary property of the text and as the result of the intention of the maker rather than as the result of the inference process carried out by the receiver of a multimodal text" (Tseronis and Pollaroli 2018, 150). To a degree, this task is taken up by studies of argumentation, both within discourse studies and beyond (for example, see the approaches outlined in many of the contributions to this volume). However, the methods of analysis used in argumentation studies such as these are primarily textual in outlook and there is comparatively little consideration of the use of non-linguistic modes in archaeological argumentation. Beyond discourse studies, non-linguistic modes similarly lack discussion in the context of 'reading' archaeology: for example, Gibbon (2014) only refers to images in the mind, not on the page, while elsewhere the traditional emphasis remains on reading the past as if it were a text (for example, Hodder and Hutson 2003). Groarke, for example, emphasises the range of semiotic resources that may be incorporated within argumentation, employed by the narrator and received by the reader:

"… there are modes of arguing that employ visuals of many different sorts (diagrams, graphs, photographs, videos, paintings, observation, etc.), tactile sensations, musical notes, non-verbal sounds, and a wide variety of other non-verbal elements. … In the age of print, an overwhelming emphasis on the verbal mode of arguing may have been adequate and appropriate. In a digital age, we need a set of modes that accommodates digital communication and the ease with which it embraces images and sounds of all sorts." (Groarke 2015, 142).

Clearly, coming to an understanding of how archaeological knowledge is created is an important endeavour, but an appreciation of how that knowledge is received and how the different modes incorporated in its communication are employed is also critical to that understanding, and to subsequent developments in knowledge creation and communication. So while analyses of discourses that look beyond texts are important, analyses that consider all parties to a discourse, rather than just those who created it, are equally so.

This emphasis on the need for multimodal analysis has been a core proposition in this chapter, with a particular stress on the importance of visual representations as one of the key vehicles in archaeological discourse. Consequently it has been argued that limiting discourse analysis to text, especially when visualisations are present, is a significant restriction in understanding the nature of that discourse. Archaeological visual representations are of more than secondary interest: "they intimately resonate with broader concerns of knowledge production and archaeological theory" (Hussain 2021, 155). Unpicking those intimate relationships within the collective ensemble of semiotic resources used in archaeological knowledge creation is a task requiring a multimodal, rather than monomodal, approach.

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