Core or Periphery? Digital Humanities from an Archaeological Perspective

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Abstract

The relationship between Digital Humanities and individual humanities disciplines is difficult to define given the uncertainties surrounding the definition of Digital Humanities itself. An examination of coverage within Digital Humanities journals narrows the range but at the same time emphasises that, while the focus of Digital Humanities might be textual, not all textually-oriented disciplines are equally represented. Trending terms also seem to suggest that Digital Humanities is more of a label of convenience, even for those disciplines most closely associated with Digital Humanities. From an archaeological perspective, a relationship between Digital Archaeology and Digital Humanities is largely absent and the evidence suggests that each is peripheral with respect to the other. Reasons for this situation are discussed, and the spatial expertise of Digital Archaeology is reviewed in relation to Digital Humanities concerns regarding the use of GIS. The conclusion is that a closer relationship is possible, and indeed desirable, but that a direct conversation between Digital Humanities, Digital Archaeology and humanities geographers needs to be established.

Determining scope

From a traditional humanities perspective, it can often seem as if Digital Humanities (DH) is not only the new kid on the block but also the monster that is garnering all the attention and sucking up available research funding. DH is seen as being better-placed to respond to the kind of large-scale collaborative research programmes increasingly favoured by funding bodies (for example, Barker *et al* 2012, 189). So, from an archaeological perspective, what is the scope of DH? and what is the nature of its relationship with the individual humanities disciplines served by DH?

Determining the scope of DH is immediately made difficult because of the lack of a clear-cut definition of what DH actually is. The annual Day of Digital Humanities with its now traditional request for definitions of the digital humanities rather underlines this situation, as does the equally traditional range of responses producing almost as many different definitions as there are scholars who responded. With perhaps one exception, none of the definitions offered in 2012 identified which fields or humanities disciplines came under the DH banner: the majority are content to leave the 'humanities' part of DH undefined, with plenty of references to broad interdisciplinarity, big tents, and traditional humanities. One contributor - Lisa McAulay - suggests that DH relates to a cluster of subject areas - literature, languages, linguistics, history, classics, anthropology, and archaeology. None in the list are surprising, although the absence of philosophy and the performing arts might be noted.

Evaluating coverage

An evaluation of the relative importance of humanities discipline within the Digital Humanities can be estimated by looking at the appearance of each term within a range of DH journals. This is admittedly a crude analysis, based on the number of papers within which a term occurs rather than the disciplinary focus of each paper, but it serves to provide an impression of the coverage of each journal.

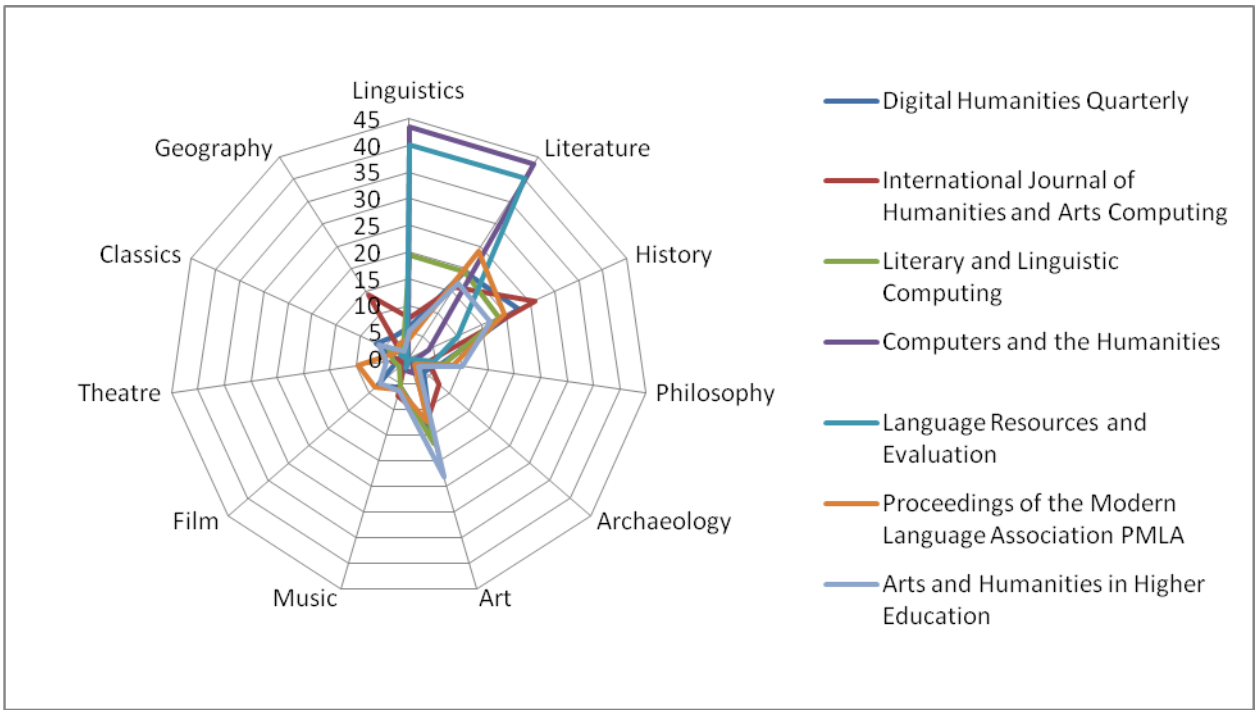

Figure 1: Distribution of papers within Digital Humanities journals, expressed as a percentage of total hits. (*IJHAC* does not include occurrences in its predecessor *History and Computing*; *PMLA* only considers papers published since 2002).

Some of the results in Figure 1 are surprising: for instance, 87% of the hits in *Computers and the Humanities* (published 1966-2004) related to literature and linguistics, almost exactly mirrored in its successor publication, *Language Resources and Evaluation*, whereas *Literary and Linguistic Computing* displays a rather more balanced set of results. The *International Journal of Humanities and Arts Computing*, perhaps reflecting its origins in the journal *History and Computing*, leans towards history and literature, but also had the highest proportion of references to archaeology (7%) - double that of the next highest ranked for archaeology (*Digital Humanities Quarterly*). *Digital Humanities Quarterly* probably displays the strongest representation across the subjects, but still retains a significant leaning towards literature and history. This underlines the close association of DH with literature, linguistics, and history, and suggests a rather different relationship with other humanities subjects, if there is one at all.

So what lies behind this apparent focus on literature, linguistics and history? Does the lack of reference to other humanities disciplines represent a lack of interest in or relevance of digital methods in those areas? Is the disciplinary scope of DH much smaller than might have been expected?

External perceptions of DH tend to view it as a text-based subject, and various DH scholars have pointed to the privileged position of text within the field of DH. For example, Pilsch suggests that "Digital humanities is, ultimately, a way of doing textual criticism. In fact ... we can suggest that digital humanities is a specialized set of assumptions about how texts work and what makes them interesting" (2012, 5). Liu defines DH broadly as combining 'humanities computing' or 'text-based' digital humanities and new media studies (2012, 10). Barker, Hardwick and Ridge suggest that "The means by which many humanists first, or only, experience the digital humanities are the tools that are being developed to assist in philological research." (Barker *et* al 2012, 187). Particularly relevant in this context, Hockey notes that "applications involving textual sources have taken center stage within the development of humanities computing as defined by its major publications" (Hockey 2004, 1). While the definitions from the Day of Digital Humanities 2012 may not emphasise disciplinary areas, several reference a focus on text, ranging from seeking patterns within texts and representing and interacting with texts. This textual emphasis would seem to support the literature, linguistics, and history focus identified in DH journals; however, other text-heavy disciplines such as classics and philosophy are not strongly represented. A strong emphasis on text, perceived or real, makes it difficult for humanities subjects which do not share that same emphasis to see the DH agenda as relevant to their own disciplines. Consequently Svensson's proposition that the strong textual focus within DH affects the scope and penetration of humanities computing (2009, 51) would appear to find support here. However, it does not explain the apparent under-representation of subjects such as philosophy and classics.

Although philosophy is closely related to computing (for example, Ess 2004), there seems to be a much more limited relationship with DH. For example, Bradley notes that while there are philosophers developing digital content or using information technology to further philosophical research, and there are a number of notable philosophers thinking about the interface between technology and ourselves, there are not numerous examples of philosophers using DH techniques in the pursuit of philosophy (Bradley 2012, 104).

The multidisciplinary nature of classics means that digital aspects may be subsumed under the headings of history, archaeology, or linguistics - or, from a classics point of view, classicists including archaeologists, ancient historians and philologists may employ digital methods and technologies (Mahony and Bodard 2010, 1). There is some dispute about the status of digital classics: for example, Crane (2004) talks of classicists aggressively integrating computerised tools into the discipline but at the same time argues that the needs of classicists are not so distinctive as to warrant a separate "classical informatics". Both Terras (2010, 187) and Rabinowitz (2011) see digital classics as more of an emergent field still in its early stages, while Cayless (2011) describes it as an underground movement, with some very high-profile projects and practitioners operating within a more generally hostile attitude towards digital ways of knowing.

Trending disciplines

Trending terms may also be revealing. For example, Google's nGram viewer can display the frequency of phrases within a sample of over 5.2 million books scanned by Google up to 2009, normalising the results by the number of books published each year. Since the ngram term must occur in at least 40 books, several phrases which might have been expected (for example, digital philosophy, digital classics) returned null results, which could in itself be seen as significant.

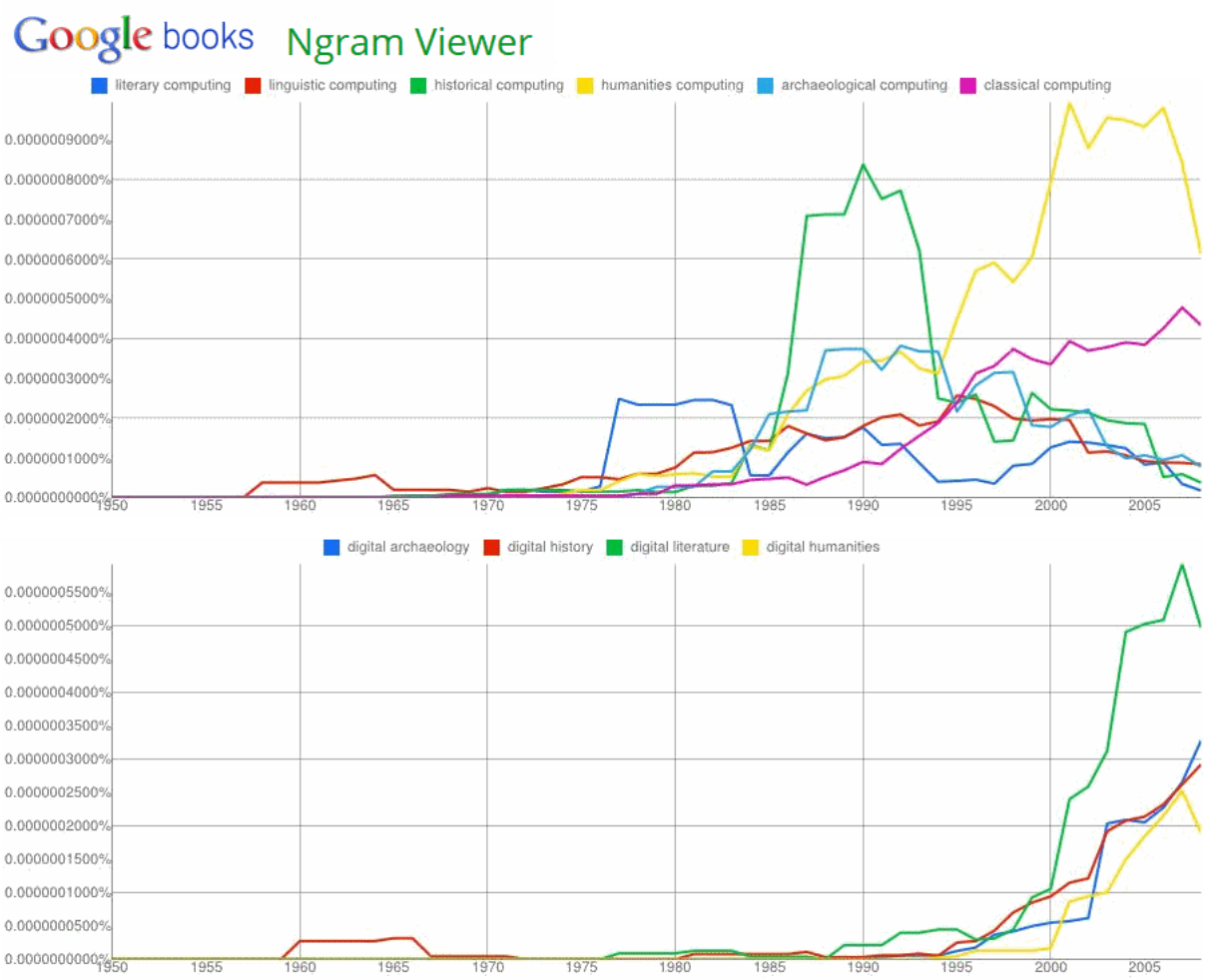

Figure 2: Google nGram results: 'traditional' labels (top) and 'digital' labels (below)

Some interesting patterns are apparent in Figure 2. References to *literary computing* peaks either side of 1980, while *linguistic computing* peaks as literary computing declines in the mid 1990s. *Historical computing* and *archaeological computing* peak in the late 1980s-early 1990s before declining. *Classical computing* underlines the limitations of this tool, as its steady growth is associated with an increasing profile of publications on classical computing devices rather than computing in the classics. *Humanities computing* peaks latest and rises highest, but like all the terms, it now appears to be in decline. Not unexpectedly, the decline of the more traditional terms for computing in the humanities is matched by the rise in use their 'digital' equivalents (the very early showing for digital history in the 1960s relates to publications on digital signalling rather than history). Perhaps unexpectedly, DH is last on the scene: *digital literature* references appear from 1975, *digital history* from 1980, and *digital archaeology* from 1988, while DH first appears around 1993. Furthermore, DH has not overtaken the other terms and remains the least common of those shown.

Leaving aside the vagaries of context-free text searching, these results seem to demonstrate a shift in emphasis towards the 'digital', with most of the traditional terms being overtaken by their digital equivalents by 2005. However, the results also suggest that individual disciplines maintained their disciplinary identity in the move to 'digital', with DH essentially acting as an umbrella term of convenience, or, alternatively representing the gradual development of a new disciplinary focus. In

the end, the disciplinary scope of DH remains unclear. On one hand, it might be expected to represent the broad church of the humanities, but in reality it seems to consist of a much smaller and more restricted group of humanities fields with some of its major constituents drifting in and out as it suits them. In that light, it would be worth examining the extent to which digital literature, digital linguistics, and digital history publications appear in more mainstream disciplinary journals, or whether their predominance in DH journals represents a choice or need to publish outside their disciplinary journals. The same question could apply to other humanities subjects - do their digital publications appear in DH journals rather than in their disciplinary outlets? Does this account for the poor showing of digital classics and digital philosophy? In archaeology, for example, there is only one computing-based journal (*Archeologia e Calcolatori*), and archaeology has a low profile within DH journals; instead, archaeological computing papers tend to appear in mainstream archaeology journals and, to a lesser extent, in disciplinary journals outside the field (such as geography). This highlights the way in which digital archaeologists participate in the discipline of archaeology more generally, whereas it has been suggested that DH scholarship is often not highly regarded, in citation terns at least, within their broader fields (Juola 2008, 73-75).

Digital Archaeology and Digital Humanities

So where does this leave archaeology and its relationship with DH? It evidently does not figure strongly in DH journals, and DH barely figures within archaeological publications. The impression from the disciplinary discussion above is that archaeology remains largely distinct - some might say aloof - from DH. Dunn has recently commented that the relationship between archaeology and DH is curiously lacking (Dunn 2012) and suggests that the reasons for this are nuanced and complex. There are certainly strong parallels between both DH and Digital Archaeology (DA) - both share similar concerns with interdisciplinarity, technology and digital methods. Indeed, the characterisation of DA and DH is not so different. For example, Dunn characterised archaeology as "a disciplinary mash-up, needing support from a range of technological infrastructures, at all levels of scale and complexity" (Dunn 2011, 98), and Daly and Evans (2006, 3) defined digital archaeology as "not so much a specialism, nor a theoretical school, but an approach - a way of better utilizing computers based on an understanding of the strengths and limits of computers and information technology as a whole". Both definitions might equally be applied to DH. It is perhaps this very similarity that, paradoxically, separates the two disciplines.

As a field, DA is well-established. Probably the earliest use of electronic data processing in European archaeology was by Peter Ihm and Jean-Claude Gardin in 1958/1959 and in the USA by James Deetz in 1960 (Cowgill 1967, 17). Since then, activity in archaeological computing has grown substantially, especially since the first personal computer revolution in the 1980s, and the annual Computer Applications and Quantitative Methods in Archaeology (CAA) conference has been meeting since 1973, with 500 delegates meeting in Southampton in March 2012. Like DH, DA has spawned a number of different centres (for example, Digitale Archäologie, based in Freiburg, the Center for Digital Archaeology (CoDA) at the University of California, Berkeley, the Laboratorio di Archaeologia Digitale at the University of Foggia, the Digital Archaeology Research Lab (DigAR) at the University of Washington, Seattle) and a range of undergraduate modules and specialised postgraduate degrees. There are also a number of tenured positions and support posts in University archaeology departments as well as a larger number of computing posts in commercial archaeology organisations (43 in the UK at the last count (Jeffrey and Aitchison 2008)). Given this existing infrastructure, it is

not unreasonable to propose that DA does not 'need' DH for legitimacy or support, although it is evident that archaeologists are happy to capitalise on digital humanities programmes if they can see the benefits for archaeology. Equally, digital humanities scholars not infrequently draw on archaeological examples in their publications (for instance, Bodenhamer 2007, 2010; Anderson *et al* 2010), often in the context of demonstrating technologies such as Geographical Information Systems (GIS).

Methodological commons?

Like archaeology, DH is frequently defined in terms of practice rather than a particular category of data (text) or a historical period (for example, Scholes and Wulfman 2008, 65, Anderson *et al* 2010, 3782). Indeed, McCarty and Short's classic diagram mapping DH emphasises this, with its central zone highlighting the methodological commons shared by the various disciplines (McCarty and Short 2002). While its authors make it clear that the map is a work in progress, it notably omits archaeology from either the set of disciplines (although 'material culture' is included) or from the 'clouds of knowing' which represent areas of learning which bear upon the field. Later updates (for example, McCarty 2005, 119) add anthropology to the cloud, which could include archaeology if its American definition is adopted. The absence of archaeological contributions to recent collaborative volumes on DH (for example, Berry 2012, Gold 2012) is matched by corresponding recent collections of DA which make only passing reference to DH (for example, Kansa *et al* 2011, Chrysanthi *et al* 2012). This serves to underline the lack of relationship between the two disciplines in either direction - digital humanists are not queuing up to access DA and digital archaeologists are not knocking on the door of DH. This apparent peripheral status of DA and DH with respect to each other could support the contention that while both disciplines are concerned with methods, their focus is rather different, with archaeology focused on the study of past material culture whereas DH has a broader, primarily textual outlook (for example, Dunn 2012). Two propositions arise from this situation; that:

- the image of archaeology as dealing with primarily long-past pre-literate societies means it fits poorly within a logo-centric DH, and
- the practices that underpin the methodologies of both DH and DA are drawn from elsewhere, not from each other, or have developed independently.

One of the problems here is that the characterisation of archaeology, at least in DH terms, is frequently flawed. While there is no doubt that archaeology deals with prehistoric societies, to define it in these terms alone is to ignore the several millennia of literate societies which are equally the subject of archaeological study. Ultimately texts are forms of material culture just as much as potsherds and flint flakes, and hence grist to archaeology's mill. Indeed, David Clarke's famous definition of archaeology as "the discipline with the theory and practice for the recovery of unobservable hominid behaviour patterns from indirect traces in bad samples" (Clarke 1973, 17) challenges rather than places limits on the subject. Furthermore, the scope and reach of archaeology - and DA - is wider than is often appreciated. As part of the archaeology of modernity (see Harrison and Schofield 2010, Schofield 2009), new areas of study such as digital forensic data recovery (for example, Ross and Gow 1999) and the investigation of digital media (for example, Huhtamo and Parikka 2011b), as well as the disciplinary implications of new information technologies (for example, Huggett 2012a, 2012b), the study of 'non-places' (transit areas and travel spaces) and

virtual worlds (Harrison and Schofield 2010, 249ff), together with contemporary conflict, human rights and disaster archaeology, are all part of archaeology as practised in the twenty-first century. Some would argue that archaeology is over-reaching itself in some of these areas - for example, Huhtamo and Parrika make it clear that they see media archaeology as quite distinct from the more typical understanding of archaeology (2011a, 3), although Liu's characterisation of media archaeology as the study of old media (2012, 16) leaves the door open. Others might argue that archaeology's moves into such areas is a response to tactical and political rather than disciplinary demands. However, the fact remains that archaeology has extended its interest and involvement into these fields, and several are also of interest to - and, in the case of digital media studies, considered to be a part of (Lui 2012, 10) - DH. At the very least, therefore, this re-presentation of archaeology offers the potential for greater interactions in future between DH and DA than there has been to date, and in the process may help to address the foreshortened, presentist focus of DH identified by Liu (2012, 15) by combining contemporary and historical objects of study.

If the character of archaeology should not present an obstacle to establishing a greater relationship with DH, the question of shared practice is perhaps more problematic. At one level, neither discipline has need of the other when it comes to the basic analysis of their data. On the other hand, both DA and DH are moving into areas in which the other already has expertise, so one might expect a productive relationship to be established at least in these contexts. In terms of DA there is a dramatic increase in interest in handling text, largely associated with the Semantic Web or Web 3.0: for instance, text mining grey literature reports and journals to extract temporal and spatial data together with associated contextual attributes (for example, Richards *et al*. 2011, Byrne and Klein 2010). However, the relationships established by DA in relation to projects such as these are primarily with computing science, not DH, despite the long history of text processing in DH. If DA seems to be bypassing DH in relation to text, DH appears to be looking beyond DA in relation to GIS. For example, although a recent volume on Spatial Humanities includes a contribution from an archaeologist (Lock 2010), the 'Suggestions for Further Reading' section contains no reference to archaeological work in GIS (Bodenhamer *et al* 2010, 177-189). Reference to archaeology appears only in relation to theoretical work on space despite archaeology being recognised elsewhere in the same volume as the first amongst the humanities to adopt GIS (Bodenhamer 2010, 21). Instead the main focus of recommended works is geography and, to a lesser extent, historical GIS. In some respects, this situation is not surprising - rather than pursue a set of complex technological methodologies mediated through another humanities discipline, is it not sensible to go straight to the discipline which is most closely associated with the development of those techniques? However, mediation through an allied humanities discipline may offer considerable benefits in terms of complementarity of theory and method, time saved through lessons learned, and so on. That said, it might appear that historical GIS performs this mediating role within DH, but if so, it is less well developed than in DA and the kinds of issues raised by, for example, Bodenhamer (2010), Boonstra (2009), Jessop (2008), and Suri (2011), are the same as those raised within DA more than fifteen years ago (for example, Gaffney *et al* 1995), which have been addressed to a varying extent since then.

Spatial differences

Perhaps as a consequence of this lack of relationship with DA, DH applications of GIS can seem very limited, even simplistic, to archaeological eyes in that they often seem to focus on interactive

hypermedia visualisation with little use of GIS analytical tools (for example, *Hypercities* (Presner 2010), *Litmap* (Hui 2010) and *GapVis* (Barker *et al* 2012) although the user interfaces of projects such as these can disguise very complex data manipulation involved in the generation of the underlying spatial data in the first place. Examples of the successful use of humanities GIS cited by Bodenhamer (2007, 2010) are, from an archaeological perspective, a combination of 3D virtual worlds and multimedia databases rather than GIS as such. As if to emphasise this, as a way of bringing together GIS and the humanities Bodenhamer describes 'deep maps of memory', in which each artefact from a place (a letter, memoir, photograph, painting, oral account, video etc.) constitutes a separate layer that can be arranged sequentially through time (Bodenhamer 2007, 105; 2010, 27-28). This concept has been taken up by Fishken (2011) among others, who proposes the creation of 'Digital Palimpsest Mapping Projects'. However, there is no sense in which the 'knowledge' of the layers is being utilised beyond the spatial and temporal layering inherent in the GIS, and these models are operating on what is essentially a multimedia methodology. In part, of course, this represents a difference between data exploration and data analysis - the analysis, such as it is, remains in the eye of the beholder. This underlines the need within the DH for the kind of spatial literacy and spatial thinking identified by Suri (2011, 182) and the specialist training referred to by Boonstra (2009, 5).

A range of specific problems with applying GIS within a DH context have been identified, and lie behind a perceived reluctance to use these tools. For example, Bodenhamer (2010, 23-24) identifies several issues:

- The complexity of the technology and the level of time and effort required to learn the techniques
- GIS favour structured data
- Ambiguity, uncertainty, nuance, and uniqueness are not readily routinised
- Managing time is problematic - GIS typically represent time as an attribute of space
- GIS rely heavily on visualisation, which is difficult for a logo-centric scholarship which does not generally think in terms of geographical space or framing spatial queries
- GIS require collaboration between technical and domain experts, putting the lone humanities scholar at a disadvantage
- GIS appear reductionist in the way data are categorised, space is defined, and complexity is handled.

These strongly reflect the conflict between positivist technology and humanist traditions also highlighted by, amongst others, Boonstra (2009, 6), Gregory and Hardie (2011, 299), Harris *et al* (2010, 168), Jessop (2008, 44), and Suri (2011, 163). The contrasts between the accuracy, precision, structure, and reductionism inherent in GIS and the humanistic emphases on uncertainty, imprecision and ambiguity are often presented as part of a critical assessment of the application and use of GIS. In a trenchant response to the archaeological critics of GIS who have raised much the same issues in the past, Cripps *et al* point to the advent of fuzzy approaches which mean that certainty is no longer required; they argue that GIS do not foster generalisation and standardisation (or at least, no more so than the book, article or presentation, and we are well-accustomed to

problematise these); and that far from being reductionist, GIS facilitate complex analyses of time, human agency and perception, and the semantics and linguistics of space (Cripps *et al* 2006, 27-28). In other words, methods to deal with these issues have been investigated and continue to be developed and, far from representing a purely pragmatic response, they are embedded in critical theory.

The danger is that preconceptions concerning GIS applications remain unchallenged through a lack of engagement with the tools and a reluctance to develop them in the search for answers to what are perceived to be the more humanistic questions. For instance, space within GIS is frequently conceived as rectilinear, isotropic (independent of direction), gridded, and framed, and consequently it establishes the conditions for distanced and dispassionate observation – the so-called 'scientific gaze' (Thomas 2004, 199) which is problematic for the humanities. However, this characterisation is not uncontested and GIS are capable of modelling alternative conceptions of space at a human scale which are not predicated on Western, post-Enlightenment perceptions. For example, during the debates surrounding the Indian Land Claims Commission (established in 1946) Western 'common-sense' notions of homogenous, bounded, stable territorial units had to be set aside for aboriginal forms of territoriality in which the spatial unit consisted of aggregates of 'tenures' held at different times (Zedeño 1997). To the Hopi, these could be places, landmarks, natural resources (herds, stands of trees, mineral outcrops), and the material record of human use of the land and its resources (burial grounds, villages, encampments, trails, shrines etc.) (Zedeño 1997, 71). Crucially, as Zedeño emphasises, this concept of space and territoriality is in stark contrast to the kind of landscape in which space is contiguous and can be comprehended at a glance (Zedeño 1997, 73). Nevertheless, it is possible to represent the richness of such a landscape within a GIS along with the human encounters, movement, perceptions, interrelationships and memories that constitute it (for example, Llobera 2007). Such a representation is never anything more than a model of reality, just as the text describing it is no more than an attempt to abstract an impression of the Hopi conceptual world.

The visual emphasis of GIS "with its reductionist allure and wondrous images" (Harris *et al* 2010, 170) is undoubtedly a highly seductive aspect of the tools. The power of the visual image is not unfamiliar to humanists -what perhaps makes GIS so powerful is that, while traditional maps can be a potent means of capturing large amounts of information, that information remains locked within the image, whereas GIS maps are generated on the fly from underlying spatial information and its associated attributes. Consequently GIS facilitate a much higher degree of flexibility: new information can be added, new data can be created through manipulating information within the existing map, and data can be removed. Of greater significance, however, is the seduction of the tool itself - the ease with which images can be generated at the push of a button and the way in which the software can be seen as protecting the user from, and hence disguises, the underlying complexities through inserting layers of opacity (Huggett 2004, 83-84), while the very use of the tool can heighten perceived authority - but all these issues emphasise the need for a properly critical approach. It may be true that the dependence of archaeologists and geographers on maps and plans make the application of GIS easier (Bodenhamer 2010, 21), but visualising DH data need not be a barrier despite its textual focus. As several DH scholars have shown, the extraction of spatial information from texts makes visualisation possible (for example, Gregory and Hardie 2011, Gregory and Cooper 2009), while archaeologists and geographers have demonstrated the potential of more qualitative approaches (see the contributions in Daniels *et* al 2011 and Dear *et al* 2011 for example).

The need to represent ambiguity and uncertainty are well-established and arguably inherent to some extent in GIS if a raster rather than vector representation is used thoughtfully. For example, vector polygons present clear unambiguous boundaries to regions when what is required is imprecisely delimited, indeterminate boundaries. Boundaries might be malleable (in the sense that the boundary shifts, expands, and contracts depending on circumstances) and permeable (recognising that things may cross from one domain to the other to varying extents, again depending on circumstances) (Kooyman 2006, 425). This is nevertheless capable of being modelled using rasters to represent the degrees of uncertainty or ambiguity. Similarly, uncertainty of location is poorly represented as vector point data. For example, archaeological sites may be recorded using a mixture of resolutions from 1m to 100m or more for a variety of reasons but are frequently represented in absolute locations, although they may be coloured according to their resolution of location. However, within the approximate area within which such a site falls, it is possible to know where the site is *not* going to be (in a river, on a cliff, for instance), enabling an estimation of the probability that a site is located in some areas rather than others, which can again be represented using graduated rasters. At a more human level, many conceive of the world in terms of their immediate surroundings, with a great deal of knowledge of space and relationships. Beyond that familiar world, things become more hazy and indistinct – scale becomes less precise, and proximity and distance become more a case of 'near', 'further away', 'a long way away', for example. Again, these can be generalisable to a series of rasters to enable this ambiguity to be incorporated within the model.

Time is undoubtedly problematic, but this is essentially in terms of its visualisation, rather than its underlying representation. For the most part, presentations of time within GIS are essentially static: snapshots representing single moments in time which can then be stitched together into sequences sampling what is a dynamic phenomenon (for example, Johnson (2002) and Gregory (2008)). An advantage of this approach is that it is recognisable and interpretable, whereas more complex three-dimensional representations of time as space-time paths, space-time prisms and potential path areas result in unfamiliar images which are difficult to assimilate (for example, Shaw *et al* 2008, Neutens *et al* 2011) as well as being very much more complex to generate. Nevertheless, the representation of time intervals (using Allen relations (Allen 1991) for instance) within the underlying GIS database can model complex temporal relationships with appropriately fuzzy components ('during', 'before', 'overlaps' and so on) which can then be retrieved as a sequence of contemporary snapshots.

It would be misplaced to assume that GIS practitioners are unaware and uncritical of the tools they use and the ways those tools affect the representation of information, but it does underline the requirement for knowledgeable users (as emphasised by Boonstra 2009, 5). This might indeed be achieved through collaboration between technical and domain experts, as Bodenhamer (2011, 24) suggests, which fits with a multiple-member interdisciplinary team model for DH research, but it is not a requirement. Alternatively the lone DH scholar may be trained in the techniques: a model essentially adopted within archaeology where archaeological GIS projects are largely undertaken by archaeologists practised in the use of GIS. The archaeological experience would suggest the need for suitable humanities-focused courses to be created in order to communicate the complexities of spatial concepts within an appropriate and meaningful context .

Building relationships?

In many respects, the adoption of GIS within DH is caught up in a series of anxiety or identity discourses within DH, DA, and also geography, which may account for many of the doubts, uncertainties, and criticisms which are voiced. Anxiety discourses tend to be associated with fields which meet their disciplinary challenges by drawing down concepts and methodologies from external subjects, and which have an intellectual centre primarily focused on praxis, with theory being derived from outside (for example, Lyytinen and King 2004, 222). This seems equally appropriate as a description of DH and DA with each seeking justification, validation, and status as part of a process of discipline-building, rather than being perceived as providing little more than low-prestige technical support for their broader communities. In the process, however, it would seem sensible and strategically appropriate to ensure that the respective discourses contribute to, rather than are at the expense of, each other.

For example, DH scholars frequently appear suspicious of what has been labelled as 'common denominator' systems (Hunt *et al* 2011, 218). These are categories of digital tools which, despite being broad-based, have been developed to accommodate scientists and engineers, with humanists being seen very much as an afterthought: "academics in the HASS [humanities, arts, and social sciences] have learned to content themselves with the few beneficial bits (or bytes) that fall their way from the technological table; nonetheless, common denominator systems are insufficient by themselves to meet the specialised needs of HASS scholars." (Hunt *et al* 2011, 218). This has also been a feature of the DA discourse in the past, where it has long been recognised that few of the digital tools used by archaeologists have been created by archaeologists specifically for archaeological use. However, this is essentially *reductio ad absurdum*: there are many tools, digital or otherwise, that have not been specifically created for DH, or DA, and yet are fundamental to each. In fact, one of the advantages of GIS is that, despite being essentially very simple, they are capable of extension, adaptation, and modification in order to better represent the complexities of the application area. The issue is therefore not the rejection of these broad-based digital tools, but the question of their development and application into new areas.

Of course, this may be precisely the kind of pragmatism that Meeks (2012) is concerned about. While he points to archaeologists as having more experience with adapting digital tools to their work than digital humanists (Meeks 2012, 95), he sees archaeology's pragmatic approach as not offering solutions to the perception that humanities needs software tools embedded with humanities rather than engineering principles. By this argument, GIS, as broad-based digital tools, and archaeologists, who are pragmatic - and by inference, uncritical - enough to turn them to use, are equally problematic in terms of DH applications. While the kinds of approaches outlined above to handling uncertainty, time, and so on may be open to the accusation of pragmatism, this would assume that the results they generate represent reality or truth in some way rather than being what they are: abstract conceptual models of virtual spaces built out of theory. In many respects, this argument is closely related to the discussions within DH about the place of building things as a scholarly activity (for example, Ramsay and Rockwell 2012; Ramsay 2011a, 2011b). Digital archaeologists, whatever the digital tools they adopt and use, are well-accustomed to the idea of creating, coding, and modifying these tools in order to facilitate research - indeed, the ability to do so can be seen as a significant factor in the consideration of a suitable tool. However, the process of construction or

modification is an integral component of research and arises out of theory, rather than being seen an end in itself.

At the same time as DH and DA are, to some extent at least, manoeuvring around each other with respect to textual and spatial issues, geography has also been positioning itself in relation to the humanities more generally. In the same way as part of archaeology's discourse has been to question whether it is a science, social science, or humanities subject, geography has situated itself in recent years on the boundaries of the social sciences and humanities (for example, Cosgrove 2011, xxiv, Dear 2011, 311-312). Indeed, Cosgrove argues that connections between geography and humanities have been strongest during periods of cultural inquisitiveness, "when imagination encounters the resistance of material reality" (Cosgrove 2011, xxiii), a characterisation that seems especially pertinent in the context of the 'digital' worlds each is seeking to create. Furthermore, both archaeology and geography with their science/social science profiles have experience of Byerley's recent warning concerning DH: if DH is seen as a response to a scenario of broader humanities budget cuts, it may end up with a series of eggs in a more expensive basket, which will be especially problematic if the humanities are seen as 'irrelevant' as ever (Byerley 2012, 3).

The humanist turn?

In such circumstances of budgetary crisis, disciplinary anxiety, and the search for relevance, it would seem that DH, DA and humanities geographers would be stronger together and weaker apart, to employ a hackneyed phrase. However, in order to define and build such a relationship between the three fields, a direct conversation is required. Dear points to an absence of such a conversation between geography and the humanities, recognising that "textual propinquity is not sufficient to produce a community of enquiry" (Dear 2011, 304) and there has likewise been no equivalent conversation between DA and DH to date. Over recent years our disciplines have experienced, to varying extents and at varying times, a 'computational turn', a 'digital turn', and a 'spatial turn': as Lock has observed, the time may have arrived for spatial technologies to develop the 'humanist turn' (Lock 2010, 103), presenting at once an opportunity and a challenge for DH in its relationship with the spatial disciplines.

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