

Original Study

Open Access

Jeremy Huggett

A Manifesto for an Introspective Digital Archaeology

Abstract: This paper presents a grand challenge for Digital Archaeology of a different kind: it is not technical in and of itself, it does not seek out technological solutions for archaeological problems, it does not propose new digital tools or digital methodologies as such. Instead, it proposes a broader challenge, one which addresses the very stuff of archaeology: an understanding of how digital technologies influence and alter our relationships with data, from their creation and storage ultimately through to the construction of archaeological knowledge. It argues that currently this area is under-theorised, under-represented, and under-valued, yet it is increasingly fundamental to the way in which we arrive at an understanding of the past.

Keywords: digital archaeology, digital data, introspection, digital intervention, digital intermediation

DOI 10.1515/opar-2015-0002

Received December 4, 2014; accepted February 2, 2015

1 Ghosts in the machine

In 2011, James Bridle coined the term New Aesthetic to describe his curation of a series of images on Tumblr which he saw as pointing

“towards new ways of seeing the world, an echo of the society, technology, politics and people that co-produce them ... It is a series of artefacts of the heterogeneous network, which recognises differences, the gaps in our overlapping but distant realities.” [1].


This New Aesthetic was predicated on the discovery and revelation of images which are embedded in digital technologies and without which they could not exist. Bridle described the New Aesthetic as ‘seeing like digital devices’ [2], although Sterling [3] argued that humans had ultimate responsibility for the creation of the digital imagery, describing the results as some kind of ‘wunderkammer’. This cabinet of curiosities sprawled randomly across image categories including information visualisation, satellite imagery, surveillance images, digital image processing, the appearance of pixellation in real world objects, the presence of artefacts and ghosting in digital images, retro 1980s 8-bit graphics, and the like which, while representations in their own right, could also serve as a reminder of how technology insinuates into modern life, changing perceptions and understanding. Bridle cites an example familiar to archaeologists:

“Every satellite image posted is a meditation on the nature of mapping, that raises issues of perspective and power relationships, the privilege of the overhead view and the monopoly on technological agency which produces it.” [4].

Archaeologists such as Thomas [5] have likewise drawn attention to the potential implications of such technologically privileged views of landscapes. On a smaller scale, digital archaeologists are familiar with

Article note: This article is a part of Topical Issue on Challenging Digital Archaeology.

***Corresponding author: Jeremy Huggett:** Archaeology, School of Humanities, University of Glasgow, Glasgow G12 8QQ, UK

 © 2015 Jeremy Huggett licensee De Gruyter Open.

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 License.

Unauthenticated

Download Date | 5/25/18 10:55 PM

the way in which the tell-tale fingerprints of software tools such as ArcGIS and AutoCAD can frequently be observed in the maps and illustrations they are used to create. However, aspects such as these have largely remained un-investigated within archaeology.

A criticism of the New Aesthetic was that it can seem to be concerned largely with surface appearances, even if those images are created and influenced by digital tools. Berry, for example, points to the way that the New Aesthetic – almost by definition – focuses on the visual [6], and suggests that non-visual computational processes involved in mediating this output, such as code and software, should also be included so as to delve beneath surface appearance to reveal the modes of creation and manipulation (see also Reilly, this volume). In the process, the ways in which digital technologies mediate their own relationships with the world can be examined. Indeed, Bridle came to recognise that the New Aesthetic was far from superficial:

“It is deeply engaged with the politics and politicisation of networked technology, and seeks to explore, catalogue, categorise, connect and interrogate these things. Where many seem to read only incoherence and illegibility, the New Aesthetic articulates the deep coherence and multiplicity of connections and influences of the network itself.” [4].

So why is the New Aesthetic relevant to a consideration of Digital Archaeology? On the one hand, the idea that objects contain embedded within them representations of aspects of their socio-technical and economic circumstances of creation is not unfamiliar to archaeologists even if it is not something that has been widely considered within the realm of Digital Archaeology to date. However, the parallels go further. Bridle argues that the New Aesthetic is a response to a widespread public failure to engage fully with technology in its construction, operation and effect, and seeks to move the debate to a deeper level without which “we just loop over and over through the same fetishisations and reifications, while the real business of the world continues unexamined” [4]. Digital Archaeology over the years can be characterised as primarily concerned with exploring the practical uses of computer techniques and technologies, and the computations that can be applied to different kinds of archaeological data in the pursuit of analysis. It has done so in an environment which has been largely uncritical, where the focus has lain in selecting and using tools, and any critique has been primarily restricted to debate surrounding the outputs [7]. The lack of a meaningful dialogue about the intervening digital technologies and their influence on the outputs has left archaeologists open to accusations of technological fetishism [8]. This is despite the fact that digital archaeologists work within a scientific discipline which, as Poster points out, is uniquely predicated upon an artefact rather than nature or culture: “The computer stands as the referent object to the discourse of Computer Science” [9]. While Poster goes on to argue that the computer scientist cannot escape this dependent relationship with the computer, the same limitation does not need to apply to the digital archaeologist, who has by nature to understand both the workings of computing technologies and material culture.

2 Digital Culture Studies

Digital archaeologists are arguably the best positioned amongst digital humanists to investigate and understand the implications, transformations, and repercussions of digital technologies. Archaeology sits on a cusp between the humanities, the social sciences, the ‘hard’ sciences, and the biological and material sciences, and this interdisciplinary character has fostered a wide-ranging set of methodologies and a highly critical approach to data collection and to methods of machine-based processing, manipulation and interpretation. Archaeology also has a very self-critical approach towards itself, with a strong tradition of self-aware analysis of new ideas and methodological change, but this has not yet been turned in an intensive and focused way towards the impact of digital technologies. Part of this may be due to an attitude which is current, and indeed encouraged in some quarters, which sees the computer as no more than a tool which consequently cannot have a significant impact on the subject. Similar failures to engage with the New Aesthetic have been characterised as wilful anti-technicalism, a form of anti-intellectualism (Bridle 2013). To deny the impact that digital technology has self-evidently had upon archaeology would be to

claim that archaeology has somehow remained aloof and untouched by the dramatic social and economic changes in society at large over the past twenty years or more in which these technologies are implicated.

The developmental history of Digital Archaeology and the apparent reluctance to pursue a more introspective approach to the digital tools and methodologies used is far from unique. For example, in the Digital Humanities the computational turn has been characterised as two revolutionary ‘waves’: the first was quantitative, the second qualitative [10], and the two waves are separated by a shift in identity from ‘humanities computing’ to ‘digital humanities’ representing a kind of ‘coming-of-age’. This broadly mirrors the archaeological experience. In the 1960s and 1970s a somewhat deterministic relationship existed between computers and quantification in which the introduction of computers made quantitative analysis of large data sets feasible, and subsequently archaeologists often struggled to offset the perception that computers in archaeology ‘meant’ quantification and multivariate statistics [11]. If trending terms in publications are any guide, the shift from ‘archaeological computing’ to ‘digital archaeology’ began around 1988, some five years before ‘digital humanities’ [12]. This marked a period of experimentation with a range of new tools and techniques ranging from artificial intelligence to computer graphics and web-based technologies, leading within a very short space of time to the introduction of large networked datasets, geographical information systems, agent-based modelling and the like. In this respect, therefore, the Digital Archaeology ‘second wave’ – whilst perhaps earlier – was not too dissimilar in outlook to the Digital Humanities experience which was characterised as “qualitative, interpretive, experiential, emotive, generative in character” [10]. At no stage in either ‘wave’ in either discipline is there a suggestion that the gaze might be turned inwards, that the object of study becomes the tool that is facilitating these developments. The focus instead is on inputs, outputs, and outcomes, rather than thinking beyond the tool [7].

3 A Third Wave?

As argued elsewhere [7], archaeological perspectives of digital technologies tend to cluster around the context of application, accounting for and justifying the use of a particular digital methodology in a specific circumstance. There is a degree of inevitability about this: as digital archaeologists we are already implicated in the system, making it difficult to stand as dispassionate, objective observers. On the other hand, philosophers of technology such as Ihde [13] argue that to some degree we must ‘go native’ and become informed participants in order to consider and be able to influence the developmental phases of technologies, as well as the effects of those already extant.

In Digital Humanities, Berry has already proposed a ‘third wave’ to follow on from the first two, and as a first step he identified the problematisation of computability “so that we are able to think critically about how knowledge in the 21st century is transformed into information through computational techniques” [14]. His focus on the digital transformation of knowledge is quite specific and linked to the programming driving the machines:

“... software that is spun like webs, invisibly around us, organising, controlling, monitoring and processing ... Software is a tangle, a knot, which ties together the physical and the ephemeral, the material and the ethereal, into a multi-linear ensemble that can be controlled and directed.” [15].

However, a broader perspective of what might constitute a ‘third wave’ within Digital Archaeology is one which seeks to examine the ways in which digital technologies may have changed what we do, how we do it, how we represent what we do, how we communicate what we do, how we understand what we do, and how others understand what we do. This constitutes a much wider and more fundamental approach to the understanding of the digital transformation of archaeological knowledge which goes beyond the programming and considers the intermediation of digital technologies at every stage of the production of archaeological knowledge. There is a degree of irony implicit here: for example, Denning pointed some years ago to the way in which, in parallel to debates on hypertext, archaeological theory has been:

“preoccupied with subverting authority, increasing multivocality, practicing reflexivity, enhancing awareness of both the social world and of the individual agent, reconfiguring the relationship of archaeology with descendant communities and other stakeholders, providing access to trains of thought and making interpretations transparent, acknowledging impermanence of ideas ... etc.” [16].

Yet with few exceptions, that preoccupation has not been turned towards the consideration of the digital technologies used within archaeology other than in a superficial way. The belief that computers increasingly facilitate all these theoretical concepts is commonplace – much less so is the recognition that, all too often, they in fact restrict and subvert these very ideals and frequently disguise that they do so through a combination of technological sleight of hand and the law of unintended consequences.

The ‘grand challenge’ presented here, therefore, is to understand the nature of the computational turn in archaeology and its effect on every stage of knowledge creation – from the theories we develop and use to the recognition of archaeological features on and in the ground, from the definition and capture of archaeological data through to the methods of structuring and recording those data, from their manipulation and analysis through to the presentation and synthesis of those data, and, ultimately, through to the construction, management, and publication of the resultant knowledge. This is to argue for a form of introspective or more self-aware Digital Archaeology, one which consciously seeks to understand the underlying processes and behaviours that sit behind the tools, technologies, and methodologies applied. In some respects, it is not dissimilar to the kind of digital introspection commonly applied to the examination of the state and behaviour of software at runtime, whether monitoring virtual machines, examining processes, tracing tasks performed by agents, etc.. The kind of introspection proposed here goes much further, however, in that the emphasis is not simply on looking beneath the surfaces, at processes and functions, but considers the larger picture: not just the context of application but the implications of that application in the first place. Taken to an extreme, introspection can lead to the reverse of what is intended – self-awareness can lead to a level of self-consciousness such that actions become frozen by indecision. That might appear to be a risk, but it is arguably one worth taking since to do otherwise threatens a somewhat naive, technocentric, consumer-oriented, technological determinism. Introspection may also appear to imply an undue focus on the adverse effects of digital technologies – to be anti-technological in some sense – but that is certainly not the intention here. The objective is to gain a greater understanding and appreciation of these technologies within their disciplinary context, and in the process advance the exercise of Digital Archaeology. As Florman has observed in an engineering context, “We begin with introspection. But the implicit conviction ... is that thought will lead to action.” [17].

4 Surfing the ‘wave’?

So what shape might this ‘third wave’ or introspective Digital Archaeology take? The scope and range is great, so the following suggestions serve only to provide examples of the kinds of investigations which might usefully be considered.

4.1 Data capture

Primary archaeological data have received little critical attention within Digital Archaeology [18], although they have been a feature of wider archaeological debate for many years. In the context of archaeological practice, Lucas has argued that as archaeologists change their mode of intervention, reality shifts and interpretations change [19]. In light of this it may be asked to what extent the move from traditional modes of data creation and access to digitally-enhanced methods represents a potential paradigm shift in our archaeological reality, or places limits on future changes [20]? For example, the increasing emphasis on 3D data capture and remote sensing – whether direct capture of point clouds using scanners or calculation of 3D points from digital photogrammetry – at a landscape, site, excavated surface, or object scale, generates large quantities of high-resolution data. At the same time, these techniques increase the distance from what is being recorded. Comparing the experience of an excavated surface recorded purely by scanning

or photogrammetry with the traditional methodology of pencil, measuring tape, permatrace etc. would suggest a different, less intimate relationship with the object of record. Furthermore, automated recording technologies such as scanners contain implicit knowledge in the sense that what they can record is designed into them and hence the data they generate are mediated in fixed, new and different ways.

4.2 Data structures

As Llobera has recognised [21], the topic of data representation has received little attention within archaeology, with the focus instead being on the choice of the data being collected in the first place. He subsequently argues that data structures, unlike the archaeological data themselves, are not interpretative although this sets aside the act of structuring – the definition and subsequent atomisation of data – which precedes their recording into a database. Digital data containers are not neutral, nor are they an ‘empty vessel’ into which data can be poured: data have to be structured in order to be represented, and the choice of representation has implications for the data [20]. What effect does the process of structuring data for a database have on the way that we think about that data, on the way we go about recording that data, the way in which we retrieve that data, and the way in which we subsequently analyse that data [11]? Furthermore, the operationalisation of data within a computer environment strips out the context of the recording – or at the very least, increases the distance from it. The theory-laden, purpose-laden, and process-laden nature of the data remains largely hidden, and none of the ways of approaching this through incorporating paradata or provenance metadata, for instance, seem feasible or realistic at present [20, 22].

4.3 Data reuse

Issues surrounding the context of data become critical in relation to data reuse, but while detailed accounts of reuse are rare, considerable emphasis is placed on its value ([23] for example). A recent study [24] highlighted that lack of context was a persistent problem in reuse as a result of a lack of explicit information about methodologies and strategies used in capture and recording. Despite this, the study noted that archaeologists still reused data, either finding alternative means of locating the missing information or – cynically, perhaps more likely – bypassing the issue of context altogether. Crucially, the amount of ‘cleansing’ and ‘enhancing’ required of reused datasets is seldom reported. Consequently we are confronted with another paradox: increased access to increasing amounts of data is offset by a growing disconnect between the data and knowledge about that data [22].

4.4 Networked data

There has been little consideration of the effect of enhanced online access to large datasets although the value of online access to data through the UK’s Archaeology Data Service has been estimated at between £13m and £58m per annum in efficiency gains [25]. Rather than a detailed consideration of the potential and consequences of such access, the emphasis largely lies in the need for more – and more open – online access seen as a natural good. This is in spite of the huge variety in terms of coverage, scope, range, practices, as well as standards entailed in those data. Although this is often seen as an advantage by its proponents, one outcome is the increasingly automated means of resolving data into semantic structures as a means of controlling and managing the data, a process which is by no means incontestable [26]. Little attention has been paid to the inflexibility of semantic ontologies: the way they have to omit terms, categories, and concepts which means that anything that does not fit in with that level of abstraction becomes invisible, unrecorded, discarded, and in the process they subtly and indiscernibly shape our knowledge of the past.

4.5 Quantity and quality

There are plenty of dystopian perspectives of the availability of vast volumes of data, whether it is described in terms of information overload, drinking from firehoses, an inability to assimilate leading to a kind of data

fatigue, or a reduction in knowledge productivity [11]. Indeed, Postman argued that information has become a form of garbage: indiscriminate, unfocused, disconnected from theory, meaning or purpose [27]. More recently, Weinberger has characterised a shift in mode of knowledge creation. Initially we pursued a form of ‘knowing-by-reducing’ which simply filtered out information by virtue of the limitations imposed by paper, since it restricts correction, is costly to reproduce, and is restricted in availability [28]. This, he argues, has been broken down by online access to large quantities of information, and changed to a process of ‘knowing-by-including’ in which the filters now bring information to our attention while pushing everything else into the background. Although in theory we can look beyond the filtered information presented to us, we are increasingly accustomed to living in a ‘filter bubble’ such as that presented by Google, Facebook and their like over which we have not only less control than we might wish, but also less control than we might know. What is the effect of ‘knowing-by-including’ on our experience of archaeological information? It is not uncommon to encounter conflicting results, errors, missing information etc. in searches through archaeological data repositories, but to what extent does the effect of filters – actual or created through categorisation, hidden or otherwise – go beyond this and influence the knowledge we subsequently create? Do we exist in archaeological ‘filter bubbles’ that have been knowingly or unwittingly created for us?

4.6 ‘Big Data’

As discussed above, networked data is available in increasing amounts but frequently without accompanying awareness of context. Far from being a problem, this is often seen as an advantage in relation to ‘big data’ – indeed, Anderson has claimed that context can be established later once statistical algorithms have found correlations in large datasets that might not otherwise be revealed [29]. The sheer quantity of ‘big data’ is frequently considered to offset any inaccuracies and errors in the data, although the idea that ‘big data’ somehow carries an aura of truth, objectivity, and accuracy through its size alone has been identified as a myth [30]. While archaeological data may not yet constitute ‘big data’, the foundations for this are being laid in the data infrastructures being constructed, the automated alignment of data from disparate sources, and the automatic extraction of data from published sources, for example [20]. What will be the implications of ‘big data’ methodologies applied to archaeological data? How will they change our approach to archaeological synthesis, for example?

4.7 Spatial determinism

Lock and Harris highlighted the spatial determinism of GIS which limited data representation to point, line, polygon and pixel, and discarded anything that could not be represented using these spatial primitives [31]. In their eyes, this led to a tendency for GIS to capture a view of reality that was heavily biased towards a scientific data-driven representation, leaving more qualitative interpretations out in the cold. A similar argument might be made for any digital graphic produced using CAD, 3D modellers, as well as GIS. Although in recent years there are plenty of examples of archaeological GIS that attempt to represent cognitive and experiential data (albeit typically through proxies such as visibility, distance, and cost-surfaces), they are always reduced to the same spatial primitives which impose a particularly characteristic Western, post Enlightenment viewpoint when the actual intent is to represent past perceptions of environment and setting. Space within GIS is frequently conceived as rectilinear, isotropic, gridded, and framed, creating the so-called ‘scientific gaze’ through distanced and dispassionate observation [5], which the introduction of more human-centred attempts at representations of landscape never entirely dispel. Consequently, we operate within a paradox: the underlying organisational and representational structures of our graphical tools limit at the same time as they enhance the kinds of models and interpretations we create of the past.

4.8 Visual perspective

Associated with issues of representation is the question of visual perspective. For example, in the early twenty-first century we are accustomed to technologically-derived views of the world which would be entirely unknown to anyone living in the mid-twentieth century, ranging from views of the Earth taken from the Mars Rover, the classic view of the Earth from the Apollo missions, to constructed views of the world assembled from satellite imagery. All constitute what Haraway has famously referred to as the ‘god trick’ which distances the observer and “sees everything from nowhere”, providing the illusion of infinite vision [32]. What effect does this uniquely privileged viewpoint have on our perceptions of the past – especially when we know that people in the past perceived their surroundings differently from us?

4.9 Handling uncertainty

Much of what we regularly represent in our models and images as bold lines and clear-cut boundaries are in reality indeterminate, of variable permeability, and incapable of being clearly demarcated. In some cases this may be because there never were clear boundaries at the time, or – as in the case of the medieval Scottish/English border, for instance – the ‘border’ was more of a transitional space, changing through time, often quite abruptly. Similarly, the representation of uncertainty within reconstruction models has frequently been a matter of debate – how interpretative areas within reconstructions can be differentiated without unduly affecting the ‘look’ of the finished work. In much the same way, physical locations of sites or finds may be represented as specific points absolutely positioned, whereas in reality the locations are imprecise. This then presupposes that areas of uncertainty are appropriately identified within accompanying documentation (and that end-users make use of it). If uncertainty is poorly represented (if at all) within digital data, how confident can we be about its outputs?

4.10 Reading and writing archaeology

The anti-hierarchical approach of hypertext was embraced as subverting traditional paradigms associated with print texts by Hodder [33] and others. This is frequently linked to web publication although hypertext theorists in fact see the web as responsible for holding back the progression of the medium, rather than promoting it. At best, the Web is a highly successful but very restricted version of a hypertext system since, except for wikis, readers cannot annotate text (other than through comments facilities), there are no user-created links, links are not typed so their purpose requires assumptions to be made which can add to disorientation, links are not automatically calculated on the basis of possible associations, and there is no source tracking, for example, all of which are characteristics of ‘true’ hypertext. This means that the subversion of the author, an attraction in the eyes of Hodder [33], Holtorf [34] and others, has not happened. Text is not being decomposed into chunks and massively interlinked; instead, very conventional whole documents, with much of their structure and paper origins clearly apparent, are being loosely linked together. As a result, divisions between author and reader, producer and consumer are being technologically reinforced rather than broken down. In some eyes this may be a good thing – indeed, Denning has asked whether non-linear presentations of information are actually beneficial in aiding understanding [16]. The influence of digital reading and writing on archaeology remains largely unexplored, however, despite its growing significance in the communication of archaeological knowledge through web and social media.

4.11 Distance and separation

A common theme in many of these areas is that of increased distance: distance from the original archaeological object, distance from the data, distance from the author/reader. This is not necessarily a problem; in some respects it parallels the idea of ‘distant reading’ in the Digital Humanities, for example. Moretti argues that this facilitates a focus on things that are larger or smaller than the text itself, thereby enabling the identification of temporal and national devices, themes, tropes, and genres – indeed, he

argues that distant reading is a condition of knowledge itself [35]. ‘Close reading’, in contrast, focuses on a very small canon, which, given the size of the potential set of texts, means that the reader has to abstract larger themes from a very much smaller sample. This approach is not itself without criticism (for example, [36,37]), but ultimately the ‘distant reading’ method primarily generates data, and leaves interpretation and explanation in the hands of the analyst. This issue of scale equally applies within an archaeological context – how much data must be assembled in order to be able to address a research question with confidence? How many sites are necessary to be able to extrapolate conclusions to the larger corpus? However, distance is more than just a question of scale. For example there is also the issue of remoteness: the recognition that there are times when the detailed small-scale (human scale?) archaeological analysis is precisely what is required. Distance can bring with it a sense of separation from the data – not necessarily in terms of the actual data to hand, but in relation to what those data purport to represent. The analyst is isolated from the object of record in a way that in some respects is no different to the relative isolation experienced through the medium of the printed volume, but unlike the printed experience the individual is insulated by the quantity, and apparent quality, usability and flexibility of the digital data. Whether insinuating technological tools into the process of data collection or receiving volumes of ‘primary’ data transmitted from remote digital archives, the increasingly arms-length relationship with those data introduces new dimensions to manipulating, understanding, and (re)communicating archaeological information.

5 A New Aesthetic for Digital Archaeology?

These suggestions are by no means a comprehensive outline of the range of areas covered by a grand challenge which seeks to understand the consequences of the digital interventions in the creation of archaeological knowledge. However, they illustrate that some of the questions relate to the recent past – how digital technologies have influenced where archaeology is today – while others look forward and consider how new directions and new technologies might affect the future of archaeology. Both are necessary to understand fully the extent to which digital archaeology has shaped and continues to shape the discipline of archaeology and consequently our understanding of the past derived through archaeological investigation and analysis. Like the New Aesthetic, the focus is a new way of seeing archaeology – looking beneath surface appearances and isolating the traces of digital interventions embedded within as a consequence of digital intermediation in the collection, manipulation, interpretation, and communication of archaeological data and the knowledge created using it.

This is not an easy thing to do – as noted above, digital archaeologists are implicated in the very thing we seek to study. However, we are accustomed to theorise about technological changes in the past, so turning the analytical gaze inward and introspectively examining the effects of the technologies we use in understanding the past should present no fear. On the other hand, the seductive power of digital technologies often means that it is easier to adopt them, to take advantage of the facilities and possibilities they appear to offer, and in the process sideline any consideration of underlying concerns or implications that might be a consequence. The structures and demands of research also militate against such an approach – the emphasis is on novel applications of new technologies, and in the rush of the new the demand to understand the implications and effects can seem unnecessarily dystopian or backward-looking. This is part of the beguilement that surrounds digital technologies: the enchantment of the new, the imperative of improvement, and a generally utopian view of the future in the short-term which, in themselves, emphasise surface appearances that conceal underlying meaning [8]. Breaking out of this mode is all the more challenging – and all the more important – in the face of what can seem to be an inexorable, unquestioning, and unchallengeable drive towards the next technical advance (for a recent example, see [38]).

To justify the benefits of a more philosophical approach to technology, Floridi uses the analogy of a technological tree which has grown so rapidly that its conceptual, ethical and cultural roots have become shallow and weak, threatening the health of the whole [39]. Consequently we need

“to expand and reinforce our conceptual understanding of our information age, and of its nature, its less visible implications, and its impact on human and environmental welfare, and thus give ourselves a chance to anticipate difficulties, identify opportunities, and resolve problems, conflicts, and dilemmas” [39].

The grand challenge presented here seeks to strengthen the roots of the archaeological technological tree, promoting healthier and more vigorous growth. By adopting an explicitly introspective approach to the technologies in our midst, digital archaeologists can unravel their influences and come to a greater understanding of their impact, importance and value. In the process, an introspective turn in Digital Archaeology can contribute to a deeper appreciation of the value of Digital Archaeology in relation to the broader discipline of archaeology, elevating Digital Archaeology from its status as a technical service. At the same time, it offers the prospect of contributing a powerful archaeological perspective to the wider consideration of the influence of digital technologies within the Humanities and beyond.

References

- [1] Bridle, J., About The New Aesthetic, nd, <http://new-aesthetic.tumblr.com/about>
- [2] Bridle, J., #sxaesthetic, 2012, <http://booktwo.org/notebook/sxaesthetic/>
- [3] Sterling, B., An essay on the New Aesthetic, *Wired*, 2012, 20 (4), <http://www.wired.com/2012/04/an-essay-on-the-new-aesthetic/>
- [4] Bridle, J., The New Aesthetic and its Politics, 2013, <http://booktwo.org/notebook/new-aesthetic-politics/>
- [5] Thomas, J., *Archaeology and Modernity*, Routledge, Abingdon, 2004
- [6] Berry, D.M., *Critical Theory and the Digital*, Bloomsbury Academic, London, 2014
- [7] Huggett, J., What lies beneath: Lifting the lid on archaeological computing, In: Crysanthi, A., Murieta Flores, P., Papadopoulos, C. (Eds.), *Thinking beyond the Tool: Archaeological computing and the interpretive process*, British Archaeological Reports International Series 2344, Archeopress, Oxford, 2012
- [8] Huggett, J., Archaeology and the new technological fetishism, *Archeologia e Calcolatori*, 2004, 15, 81-92
- [9] Poster, M., *The Mode of Information: Poststructuralism and Social Context*. Polity, Cambridge, 1990.
- [10] Schnapp, J., Presner, T., *The Digital Humanities Manifesto 2.0*, 2009, http://www.humanitiesblast.com/manifesto/Manifesto_V2.pdf
- [11] Huggett, J., The Past in Bits: towards an archaeology of information technology, *Internet Archaeology*, 2004, 15, <http://dx.doi.org/10.11141/ia.15.4>
- [12] Huggett, J., Core or periphery? Digital Humanities from an archaeological perspective, *Historical Research / Historische Sozialforschung*, 2012, 37 (3), 86-105
- [13] Ihde, D., *Philosophy of technology*, In: Kemp, P., (Ed.) *World and Worldhood*, 2004, Springer, Netherlands, 2004
- [14] Berry, D.M., The computational turn - thinking about the digital humanities, *Culture Machine*, 2011, 12, 1-22
- [15] Berry, D.M., *The Philosophy of Software: Code and Mediation in the Digital Age*, Palgrave, London, 2011
- [16] Denning, K., ‘The Storm of Progress’ and Archaeology for an Online Public, *Internet Archaeology*, 2004, 15. <http://dx.doi.org/10.11141/ia.15.1>
- [17] Florman, S., *The Introspective Engineer*, St Martin’s Press, New York, 1997
- [18] Kansa, E., Witcher Kansa, S., Burton, M., Stankowski, C., Googling the grey: open data, web services and semantics, *Archaeologies: Journal of the World Archaeological Congress*, 2010, 6 (2), 301-326
- [19] Lucas, G., *Understanding the Archaeological Record*. Cambridge University Press, New York, 2012
- [20] Huggett, J., Digital haystacks: open data and the transformation of archaeological knowledge, In: Edwards, B., Wilson, A., (Eds.), *Open Source Archaeology: Ethics and Practice*, De Gruyter Open, Warsaw, 2015
- [21] Llobera, M., Archaeological visualization: towards an Archaeological Information Science (AISC), *Journal of Archaeological Method and Theory*, 2011, 18, 193-223
- [22] Huggett, J., Promise and paradox: accessing open data in archaeology, In: Mills, C., Pidd, M., Ward, E. (Eds.), *Proceedings of the Digital Humanities Congress 2012 (Studies in the Digital Humanities)*, HRI Online Publications, Sheffield, 2014, <http://www.hronline.ac.uk/openbook/chapter/dhc2012-huggett>
- [23] Naylor, J., Richards, J., Third-party data for first class research, *Archeologia e Calcolatori*, 2005, 16, 83-91
- [24] Faniel, I., Kansa, E., Witcher Kansa, S., Barrera-Gomez, J., Yakel, E., The challenges of digging data: a study of context in archaeological data reuse, *Proceedings of the 13th ACM/IEEE-CS Joint conference on Digital Libraries (JCDL ‘13)*, Association for Computing Machinery, New York, 2013, 295-304, <http://dx.doi.org/10.1145/2467696.2467712>
- [25] Beagrie, N., Houghton, J., The Value and Impact of the Archaeology Data Service: A study and methods for enhancing sustainability, 2013, <http://archaeologydataservice.ac.uk/research/impact>
- [26] Huggett, J., Lost in information? Ways of knowing and modes of representation in e-archaeology, *World Archaeology*, 2012, 44 (4), 538-552

- [27] Postman, N., *Technopoly. The Surrender of Culture to Technology*, Random House, New York, 1993
- [28] Weinberger, D., *Too Big to Know*, Basic Books, New York, 2011
- [29] Anderson, C., The End of Theory: the Data Deluge Makes the Scientific Method Obsolete, *Wired*, 2008, 16 (7), http://www.wired.com/science/discoveries/magazine/16-07/pb_theory/
- [30] boyd, d., Crawford, K., Critical questions for Big Data, *Information, Communication & Society*, 2012, 15 (5), 662-679
- [31] Lock, G., Harris, T., Introduction: return to Ravello, In: Lock, G. (Ed.), *Beyond the map: archaeology and spatial technologies*, IOS Press, Amsterdam, 2000, xiii-xxv
- [32] Haraway, D., *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective*, *Feminist Studies*, 1988, 14 (3), 575-599
- [33] Hodder, I., Archaeology and global information systems, *Internet Archaeology*, 1999, 6. <http://dx.doi.org/10.11141/ia.6.1>
- [34] Holtorf, C., The future of electronic scholarship, *Internet Archaeology*, 2004, 15. <http://dx.doi.org/10.11141/ia.15.11>
- [35] Moretti, F., Conjectures on World Literature, *New Left Review*, 2000, 1, 54-68
- [36] Serlen, R., The Distant Future? Reading Franco Moretti, *Literature Compass*, 2010, 7 (3), 214-225
- [37] Ross, S., In Praise of Overstating the Case: A review of Franco Moretti, *Distant Reading* (London: Verso, 2013), *Digital Humanities Quarterly*, 2014, 8 (1).1. <http://www.digitalhumanities.org/dhq/vol/8/1/000171/000171.html>
- [38] Beale, G., Reilly, P., Additive Archaeology: the spirit of virtual archaeology reprinted, In: Papadopoulos, C., Paliou, E., Chrysanthi, A., Kotoula, E., Sarris, A. (Eds.) *Archaeological Research in the Digital Age: Proceedings of the 1st Conference on Computer Applications and Quantitative Methods in Archaeology Greek Chapter (CAA-GR)*, Institute for Mediterranean Studies - Foundation of Research and Technology (IMS-FORTH), Rethymno, 2015, 120-128
- [39] Floridi, L., The information society and its philosophy: introduction to the special Issue on the philosophy of information, *The Information Society*, 2009, 25 (3), 153-58