THE COMPUTATIONAL TURN: THINKING ABOUT THE DIGITAL HUMANITIES

David M. Berry

Introduction

Few dispute that digital technology is fundamentally changing the way in which we engage in the research process. Indeed, it is becoming more and more evident that research is increasingly being mediated through digital technology. Many argue that this mediation is slowly beginning to change what it means to undertake research, affecting both the epistemologies and ontologies that underlie a research programme. Of course, this development is variable depending on disciplines and research agendas, with some more reliant on digital technology than others, but it is rare to find an academic today who has had no access to digital technology as part of their research activity. Library catalogues are now probably the minimum way in which an academic can access books and research articles without the use of a computer, but, with card indexes dying a slow and certain death (Baker, 1996, 2001), there remain few outputs for the non-digital scholar to undertake research in the modern university. Email, Google searches and bibliographic databases are become increasingly crucial, as more of the world libraries are scanned and placed online. Whilst some decry the loss of the skills and techniques of older research traditions, others have warmly embraced what has come to be called the digital humanities (Schreibman *et al.*, 2008; Schnapp & Presner, 2009; Presner, 2010; Hayles, 2011).

The digital humanities try to take account of the plasticity of digital forms and the way in which they point toward a new way of working with representation and mediation, what might be called the digital 'folding' of reality, whereby one is able to approach culture in a radically new way. To mediate an object, a digital or *computational* device requires that this object be translated into the digital code that it can understand. This minimal transformation is effected

through the input mechanism of a socio-technical device within which a model or image is stabilised and attended to. It is then internally transformed, depending on a number of interventions, processes or filters, and eventually displayed as a final calculation, usually in a visual form. This results in real-world situations where computation is event-driven and divided into discrete processes to undertake a particular user task. The key point is that without the possibility of *discrete* encoding there is no object for the computational device to process. However, in cutting up the world in this manner, information about the world necessarily has to be discarded in order to store a representation within the computer. In other words, a computer requires that everything is transformed from the continuous flow of our everyday reality into a grid of numbers that can be stored as a representation of reality which can then be manipulated using algorithms. These subtractive methods of understanding reality (*episteme*) produce new knowledges and methods for the control of reality (*techne*). They do so through a digital mediation, which the digital humanities are starting to take seriously as their problematic.

The digital humanities themselves have had a rather interesting history. Starting out as 'computing in the humanities', or 'humanities computing', in the early days they were often seen as a technical support to the work of the 'real' humanities scholars, who would drive the projects. This involved the application of the computer to the disciplines of the humanities, something that has been described as treating the 'machine's efficiency as a servant' rather than 'its participant enabling of criticism' (McCarty, 2009). As Hayles explains, changing to the term '"Digital Humanities" was meant to signal that the field had emerged from the low-prestige status of a support service into a genuinely intellectual endeavour with its own professional practices, rigorous standards, and exciting theoretical explorations' (Hayles, 2011). Ironically, as the projects became bigger and more complex, and as it developed computational techniques as an intrinsic part of the research process, technically proficient researchers increasingly saw the computational as part and parcel of what it meant to do research in the humanities itself. That is, computational technology has become the very condition of possibility required in order to think about many of the questions raised in the humanities today. For example, as Schnapp and Presner explain in the *Digital Humanities Manifesto 2.0*,

> The first wave of digital humanities work was quantitative, mobilizing the search and retrieval

> powers of the database, automating corpus linguistics, stacking hypercards into critical arrays. The second wave is *qualitative, interpretive, experiential, emotive, generative in character*. It harnesses digital toolkits in the service of the Humanities' core methodological strengths: attention to complexity, medium specificity, historical context, analytical depth, critique and interpretation. (2009, original emphasis)

Presner argues further that

> the first wave of Digital Humanities scholarship in the late 1990s and early 2000s tended to focus on large-scale digitization projects and the establishment of technological infrastructure, [while] the current second wave of Digital Humanities -- what can be called 'Digital Humanities 2.0' -- is deeply generative, creating the environments and tools for producing, curating, and interacting with knowledge that is 'born digital' and lives in various digital contexts. While the first wave of Digital Humanities concentrated, perhaps somewhat narrowly, on text analysis (such as classification systems, mark-up, text encoding, and scholarly editing) within established disciplines, Digital Humanities 2.0 introduces entirely new disciplinary paradigms, convergent fields, hybrid methodologies, and even new publication models that are often not derived from or limited to print culture. (2010: 6)

The question of quite how the digital humanities undertake their research, and whether the notions of first and second wave digital humanities captures the current state of different working practices and methods in the digital humanities, remains contested. Yet these can be useful analytical concepts for thinking through the changes in the digital humanities. We might, however, observe the following: first-wave digital humanities involved the building of infrastructure in the studying of humanities texts through digital repositories, text markup, etc., whereas second-wave digital humanities expands the notional limits of the archive to include digital works, and so bring to bear the humanities' own methodological toolkits to look at 'born-

digital' materials, such as electronic literature (e-lit), interactive fiction (IF), web-based artefacts, and so forth.

I would like to explore here a tentative path for a third wave of the digital humanities, concentrated around the underlying *computationality* of the forms held within a computational medium. That is, I propose to look at the *digital* component of the digital humanities in the light of its medium specificity, as a way of thinking about how medial changes produce epistemic changes. This approach draws from recent work in software studies and critical code studies, but it also thinks about the questions raised by platform studies, namely the specifics of general computability made available by specific platforms (Fuller, 2008; Manovich, 2008; Montfort & Bogost, 2009; Berry, 2011). I also want to suggest that neither first nor second-wave digital humanities really problematized what Lakatos (1980) would have called the 'hard-core' of the humanities, the unspoken assumptions and ontological foundations which support the 'normal' research that humanities scholars undertake on an everyday basis. Indeed, we could say that third-wave digital humanities points the way in which digital technology highlights the anomalies generated in a humanities research project and which leads to the questioning of the assumptions implicit in such research, e.g. close reading, canon formation, periodization, liberal humanism, etc. We are, as Presner argues, 'at the beginning of a shift in standards governing permissible problems, concepts, and explanations, and also in the midst of a transformation of the institutional and conceptual conditions of possibility for the generation, transmission, accessibility, and preservation of knowledge' (2010: 10).

To look into this issue, I want to start with an examination of the complex field of understanding culture through digital technology. Indeed, I argue that to understand the contemporary born-digital culture and the everyday practices that populate it – the focus of a digital humanities second wave – we need a corresponding focus on the computer code that is entangled with all aspects of our lives, including reflexivity about how much code is infiltrating the academy itself. As Mathew Fuller argues, 'in a sense, all intellectual work is now "software study", in that software provides its media and its context… [yet] there are very few places where the specific nature, the materiality, of software is studied except as a matter of engineering' (2006). We also need to bring to the fore the 'structure of feeling' that computer code facilitates and the way in which people use software in their research thinking and everyday

practices. This includes the increase in the acceptance and use of software in the production, consumption and critique of culture.

Thus, there is an undeniable cultural dimension to computation and the medial affordances of software. This connection again points to the importance of engaging with and understanding code: indeed, computer code can serve as an index of digital culture (imagine digital humanities mapping different programming languages to the cultural possibilities and practices that it affords, e.g. HTML to cyberculture, AJAX to social media).[1] This means that we can ask the question: what is culture after it has been 'softwarized'? (Manovich, 2008:41). Understanding digital humanities is in some sense then understanding code, and this can be a resourceful way of understanding cultural production more generally: for example, just as digital typesetting transformed the print newspaper industry, eBook and eInk technologies are likely to do so again. We thus need to take computation as the key issue that is underlying these changes across mediums, industries and economies.

Knowing knowledge

In trying to understand the digital humanities our first step might be to problematize *computationality*, so that we are able to think critically about how knowledge in the 21st century is transformed into information through computational techniques, particularly within software. It is interesting that at a time when the idea of the university is itself under serious rethinking and renegotiation, digital technologies are transforming our ability to use and understand information outside of these traditional knowledge structures. This is connected to wider challenges to the traditional narratives that served as unifying ideas for the university and, with their decline, has led to difficulty in justifying and legitimating the postmodern university vis-à-vis government funding.

Historically, the role of the university has been closely associated with the production of knowledge. For example, in 1798 Immanuel Kant outlined an argument for the nature of the university titled *The Conflict of the Faculties.* He argued that all of the university's activities should be organised by a single regulatory idea, that of the concept of reason. As Bill Readings (1996) stated:

> Reason on the one hand, provide[d] the *ratio* for all the disciplines; it [was] their organizing

> principle. On the other hand, reason [had] its own faculty, which Kant names[d] 'philosophy' but which we would now be more likely to call the 'humanities'. (Readings, 1996: 15)

Kant argued that reason and the state, knowledge and power, could be unified in the university by the production of individuals who would capable of rational thought and republican politics – students trained for the civil service and society. Kant was concerned with the question of regulative public reason, that is, with how to ensure stable, governed and governable regimes which can rule free people, in contrast to tradition represented by monarchy, the Church or a Leviathan. This required universities, as regulated knowledge-producing organisations, to be guided and overseen by the faculty of philosophy, which could ensure that the university remained rational. This was part of a response to the rise of print culture, growing literacy and the kinds of destabilising effects that this brought. Thus, without resorting to dogmatic doctrinal force or violence, one could have a form of perpetual peace by the application of one's reason.[2]

This was followed by the development of the modern university in the 19th century, instituted by the German Idealists, such as Schiller and Humboldt, who argued that there should be a more explicitly political role to the structure given by Kant. They argued for the replacement of reason with culture, as they believed that culture could serve as a 'unifying function for the university' (Readings, 1996: 15). For the German Idealists like Humboldt, culture was the sum of all knowledge that is studied, as well as the cultivation and development of one's character as a result of that study. Indeed, Humboldt proposed the founding of a new university, the University of Berlin, as a mediator between national culture and the nation-state. Under the project of 'culture', the university would be required to undertake both research and teaching, i.e., the production and dissemination of knowledge respectively. The modern idea of a university therefore allowed it to become the preeminent institution that unified ethnic tradition and statist rationality by the production of an educated cultured individual. The German Idealists proposed

> that the way to reintegrate the multiplicity of known facts into a unified cultural science is through *Bildung*, the ennoblement of character… The university produces not servants but *subjects*.

> That is the point of the pedagogy of *Bildung*, which teaches knowledge acquisition as a *process* rather than the acquisition of knowledge as a product. (Reading, 1996: 65-67)

This notion was given a literary turn by the English, in particular John Henry Newman and Mathew Arnold, who argued that literature, not culture or philosophy, should be the central discipline in the university, and also in national culture more generally.[3] Literature therefore became institutionalised within the university 'in explicitly national terms and [through] an organic vision of the possibility of a unified national culture' (Readings, 1996: 16). This became regulated through the notion of a literary canon, which was taught to students to produce literary subjects as national subjects.

Readings argues that in the postmodern university we now see the breakdown of these ideals, associated particularly with the rise of the notion of the 'university of excellence' -- which for him is a concept of the university that has no content, no referent. What I would like to suggest is that today, we are beginning to see instead the cultural importance of the digital as the unifying idea of the university. Initially this has tended to be associated with notions such as *information literacy* and *digital literacy*, betraying their debt to the previous literary conception of the university, albeit understood through vocational training and employment. However, I want to propose that, rather than learning a *practice* for the digital, which tends to be conceptualised in terms of ICT skills and competences (see for example the European Computer Driving License[4]), we should be thinking about what reading and writing actually should mean in a computational age. This is to argue for critical understanding of the *literature* of the digital, and through that develop a shared digital culture through a form of digital *Bildung*. Here I am not calling for a return to the humanities of the past, to use a phrase of Fuller (2010), 'for some humans', but rather to a liberal arts that is 'for all humans'. To use the distinction introduced by Hofstadter (1963), this is to call for the development of a digital *intellect* -- as opposed to a digital *intelligence*. Hofstadter writes:

> Intellect… is the critical, creative, and contemplative side of mind. Whereas intelligence seeks to grasp, manipulate, re-order, adjust, intellect examines, ponders, wonders, theorizes, criticizes, imagines. Intelligence will seize the immediate meaning in a situation and evaluate it.

> Intellect evaluates evaluations, and looks for the meanings of situations as a whole… Intellect [is] a unique manifestation of human dignity. (Hofstadter, 1963: 25)

The digital assemblages that are now being built not only promise great change at the level of the individual human actor. They provide destabilising amounts of knowledge and information that lack the regulating force of philosophy -- which, Kant argued, ensures that institutions remain rational. Technology enables access to the databanks of human knowledge from anywhere, disregarding and bypassing the traditional gatekeepers of knowledge in the state, the universities and the market. There no longer seems to be the professor who tells you what you should be looking up and the 'three arguments in favour of it' and the 'three arguments against it'. This introduces not only a moment of societal disorientation, with individuals and institutions flooded with information, but also offers a computational solution to this state of events in the form of computational rationalities--something that Turing (1950) described as super-critical modes of thought. Both of these forces are underpinned at a deep structural level by the conditions of possibility suggested by computer code.

As mentioned previously, computer code enables new communicative processes, and with the increasing social dimension of networked media the possibility of new and exciting forms of collaborative thinking arises. This is not the collective intelligence discussed by Levy (1999); rather, it is the promise of a collective *intellect*. The situation is reminiscent of the medieval notion of the *universitatis*, but recast in a digital form, as a society or association of actors who can think critically together, mediated through technology. It further raises the question of what new modes of collective knowledge software can enable or constitute. Can software and code take us beyond the individualising trends of blogs, comments, twitter feeds, and so forth, and make possible something truly collaborative -- something like the super-critical thinking that is generative of ideas, modes of thought, theories and new practices? There is certainly something interesting about real-time stream forms of digital memory in that they are not afforded towards the past, as history, but neither are they directed towards a form of futurity. Instead we might say they seem to now-mediate? new-mediate? life-mediate? *Jetztzeit*-mediate (Benjamin, 1992: 252-3)? In other words, they gather together the newness of a particular group of streams, a kind of collective writing, that has the potential

to be immensely creative. These are possible rich areas for research for a third-wave digital humanities that seeks to understand these potentially new forms of literature and the medium that supports them.

For the research and teaching disciplines within the university, the digital shift could represent the beginnings of a moment of 'revolutionary science', in the Kuhnian sense of a shift in the ontology of the positive sciences and the emergence of a constellation of new 'normal science' (Kuhn 1996). This would mean that the disciplines would, ontologically, have a very similar Lakatosian computational 'hard core' (Lakatos, 1980).[5] This has much wider consequences for the notion of the unification of knowledge and the idea of the university (Readings, 1996). Computer science could play a foundational role with respect to the other sciences, supporting and directing their development, even issuing 'lucid directives for their inquiry'.[6] Perhaps we are beginning to see reading and writing computer code as part of the pedagogy required to create a new subject produced by the university, a *computational* or *data-centric* subject.[7] This is, of course, not to advocate that the *existing* methods and practices of computer science become hegemonic, rather that a *humanistic* understanding of technology could be developed, which also involves an urgent inquiry into what is human about the *computational* humanities or social sciences. In a related manner, Fuller (Fuller, S., 2006) has called for a 'new sociological imagination', pointing to the historical project of the social sciences that have been committed to 'all and only humans', because they 'take all human beings to be of equal epistemic interest and moral concern' (Fuller, 2010: 242). By drawing attention to 'humanity's ontological precariousness' (244), Fuller rightly identifies that the project of humanity requires urgent thought, and, we might add, even more so in relation to the challenge of a *computationality* that threatens our understanding of what is required to be identified as human at all.

If software and code become the condition of possibility for unifying the multiple knowledges now produced in the university, then the ability to think oneself, taught by rote learning of methods, calculation, equations, readings, canons, processes, etc., might become less important. Although there might be less need for an *individual* ability to perform these mental feats or, perhaps, even recall the entire canon ourselves due to its size and scope, using technical devices, in conjunction with collaborative methods of working and studying, would enable a cognitively supported method

instead. The internalisation of particular practices that have been instilled for hundreds of years in children and students would need to be rethought, and in doing so the commonality of thinking *qua* thinking produced by this pedagogy would also change. Instead, reasoning could shift to a more conceptual or communicative method of reasoning, for example, by bringing together comparative and communicative analysis from different disciplinary perspectives, and by knowing how to use technology to achieve a usable result – a rolling process of reflexive thinking and collaborative rethinking.

Relying on technology in a more radically decentred way, depending on technical devices to fill in the blanks in our minds and to connect knowledge in new ways, would change our understanding of knowledge, wisdom and intelligence itself. It would be a radical decentring in some ways, as the Humboldtian subject filled with culture and a certain notion of rationality would no longer exist; rather, the computational subject would know where to recall culture as and when it was needed in conjunction with computationally available others, a *just-in-time* cultural subject, perhaps, to feed into a certain form of connected *computationally* supported thinking through and visualised presentation. Rather than a method of thinking with eyes and hand, we would have a method of thinking with eyes and screen.[8]

This doesn't have to be dehumanising. Latour and others have rightly identified the domestication of the human mind that took place with pen and paper (Latour, 1986). This is because computers, like pen and paper, help to stabilise meaning by cascading and visualising encoded knowledge that allows it to be continually 'drawn, written, [and] recoded' (Latour, 1986: 16). Computational techniques could give us greater powers of thinking, larger reach for our imaginations, and, possibly, allow us to reconnect to political notions of equality and redistribution based on the potential of computation to give to each according to their need and to each according to their ability. This is the point made forcefully by Fuller (2010: 262), who argues that we should look critically at the potential for inequality which is created when new technologies are introduced into society. This is not merely a problem of a 'digital divide', but a more fundamental one of how we classify those that are more 'human' than others, when access to computation and information increasingly has to pass through the market.

Towards a digital humanities?

The importance of understanding computational approaches is increasingly reflected across a number of disciplines, including the arts, humanities and social sciences, which use technologies to shift the critical ground of their concepts and theories – something that can be termed a *computational turn*.[9] This is shown in the increasing interest in the *digital humanities* (Schreibman *et al*., 2008) and *computational social science* (Lazer *et al*., 2009), as evidenced, for example, by the growth in journals, conferences, books and research funding. In the digital humanities 'critical inquiry involves the application of algorithmically facilitated search, retrieval, and critical process that… originat[es] in humanities-based work'; therefore 'exemplary tasks traditionally associated with humanities computing hold the digital representation of archival materials on a par with analysis or critical inquiry, as well as theories of analysis or critical inquiry originating in the study of those materials' (Schreibman *et al*., 2008: xxv). In social sciences, Lazer *et al*. argue that 'computational social science is emerging that leverages the capacity to collect and analyze data with an unprecedented breadth and depth and scale' (2009).

Latour speculates that there is a trend in these informational cascades, which is certainly reflected in the ongoing digitalisation of arts, humanities and social science projects that tends towards 'the direction of the greater merging of figures, numbers and letters, merging greatly facilitated by their homogenous treatment as binary units in and by computers' (Latour, 1986: 16). The financial considerations are also new with these computational disciplines, as they require more money and organisation than the old individual scholar of lore did. Not only are the start-up costs correspondingly greater, usually needed to pay for the researchers, computer programmers, computer technology, software, digitisation costs, etc., but there are real questions about sustainability of digital projects, such as: 'Who will pay to maintain the digital resources?' 'Will the user forums, and user contributions, continue to be monitored and moderated if we can't afford a staff member to do so? Will the wiki get locked down at the close of funding or will we leave it to its own devices, becoming an online-free-for all?' (Terras, 2010).[10] It also raises a lot of new ethical questions for social scientists and humanists to grapple with. As argued in *Nature*,

> For a certain sort of social scientist, the traffic patterns of millions of e-mails look like manna

> from heaven. Such data sets allow them to map formal and informal networks and pecking orders, to see how interactions affect an organization's function, and to watch these elements evolve over time. They are emblematic of the vast amounts of structured information opening up new ways to study communities and societies. Such research could provide much-needed insight into some of the most pressing issues of our day, from the functioning of religious fundamentalism to the way behaviour influences epidemics… But for such research to flourish, it must engender that which it seeks to describe… Any data on human subjects inevitably raise privacy issues, and the real risks of abuse of such data are difficult to quantify, (*Nature,* 2007)

For Latour, 'sociology has been obsessed by the goal of becoming a quantitative science. Yet it has never been able to reach this goal because of what it has defined as being quantifiable within the social domain…'. Thus, he adds, '[i]t is indeed striking that at this very moment, the fast expanding fields of "data visualisation", "computational social science" or "biological networks" are tracing, before our eyes, just the sort of data' that sociologists such as Gabriel Tarde, at the turn of the 20th century, could merely speculate about (Latour, 2010: 116).

Further, it is not merely the quantification of research which was traditionally qualitative that is offered with these approaches. Rather, as Unsworth argues, we should think of these computational 'tools as offering provocations, surfacing evidence, suggesting patterns and structures, or adumbrating trends' (Unsworth, quoted in Clement *et al.*, 2008). For example, the methods of 'cultural analytics' make it possible, through the use of quantitative computational techniques, to understand and follow large-scale cultural, social and political processes for research projects – that is, it offers massive amounts of literary or visual data analysis (see Manovich and Douglas, 2009). This is a distinction that Moretti (2007) referred to as *distant* versus *close* readings of texts. As he points out, the traditional humanities focuses on a 'minimal fraction of the literary field',

> A canon of two hundred novels, for instance, sounds very large for nineteenth-century Britain

> (and is much larger than the current one), but is still less than one per cent of the novels that were actually published: twenty thousand, thirty, more, no one really knows -- and close reading won't help here, a novel a day every day of the year would take a century or so... And it's not even a matter of time, but of method: a field this large cannot be understood by stitching together separate bits of knowledge about individual cases, because it isn't a sum of individual cases: it's a collective system, that should be grasped as such, as a whole, (Moretti, 2007: 3-4)

It is difficult for the traditional arts, humanities and social sciences to completely ignore the large-scale digitalisation effort going on around them, particularly when large quantities of research money are available to create archives, tools and methods in the digital humanities and computational social sciences. However, less understood is the way in which the digital archives being created are deeply computational in structure *and* content, because the computational logic is entangled with the digital representations of physical objects, texts and 'born digital' artefacts. Computational techniques are not merely an instrument wielded by traditional methods; rather they have profound effects on all aspects of the disciplines. Not only do they introduce new methods, which tend to focus on the identification of novel patterns in the data as against the principle of narrative and understanding, they also allow the modularisation and recombination of disciplines within the university itself.

Computational approaches facilitate disciplinary hybridity that leads to a post-disciplinary university -- which can be deeply unsettling to traditional academic knowledge. Software allows for new ways of reading and writing. For example, this is what Tanya Clement says on the distant reading of Gertrude Stein's *The Making of Americans*,

> *The Making of Americans* was criticized by [those] like Malcolm Cowley who said Stein's 'experiments in grammar' made this novel 'one of the hardest books to read from beginning to end that has ever been published'…. The highly repetitive nature of the text, comprising almost 900 pages and 3174 paragraphs with only approximately 5,000 unique words, makes

> keeping tracks of lists of repetitive elements unmanageable and ultimately incomprehensible... [However] text mining allowed me to use statistical methods to chart repetition across thousands of paragraphs… facilitated my ability to read the results by allowing me to sort those results in different ways and view them within the context of the text. As a result, by visualizing clustered patterns across the text's 900 pages of repetitions… [th]is discovery provides a new key for reading the text as a circular text with two corresponding halves, which substantiates and extends the critical perspective that *Making* is neither inchoate nor chaotic, but a highly systematic and controlled text. This perspective will change how scholars read and teach *The Making of Americans*. (Clement, quoted in Clement, Steger, Unsworth, and Uszkalo, 2008)

I wouldn't want to overplay the distinction between pattern and narrative as differing modes of analysis. Indeed, patterns implicitly require narrative in order to be understood, and it can be argued that code itself consists of a narrative form that allows databases, collections and archives to function at all. Nonetheless, pattern and narrative are useful analytic terms that enable us to see the way in which the computational turn is changing the nature of knowledge in the university and, with it, the kind of computational subject that the university is beginning to produce. As Bruce Sterling argues,

> 'Humanistic heavy iron': it's taken a long time for the humanities to get into super computing, and into massive database management. They are really starting to get there now. You are going to get into a situation where even English professors are able to study every word ever written about, or for, or because of, Charles Dickens or Elizabeth Barrett Browning. That's just a different way to approach the literary corpus. I think there is a lot of potential there. (Sterling, 2010)

Indeed, there is a cultural dimension to this process and, as we become more used to computational visualisations, we will expect to see them and use them with confidence and fluency. The computational subject is a key requirement for a data-centric age,

certainly when we begin to look at case studies that demonstrate how important a computational comportment can be in order to perform certain forms of public and private activities in a world that is increasingly pervaded by computational devices. In short, *Bildung* is still a key idea in the digital university, not as a subject trained in a vocational fashion to perform instrumental labour, nor as a subject skilled in a national literary culture, but rather as a subject which can unify the information that society is now producing at increasing rates, and which understands new methods and practices of critical reading (code, data visualisation, patterns, narrative) and is open to new methods of pedagogy to facilitate it. Indeed, Presner (2010) argues that the digital humanities

> must be engaged with the broad horizon of possibilities for building upon excellence in the humanities while also transforming our research culture, our curriculum, our departmental and disciplinary structures, our tenure and promotion standards, and, most of all, the media and format of our scholarly publications. (Presner, 2010: 6)

This is a subject that is highly computationally communicative, and that is also able to access, process and visualise information and results quickly and effectively. At all levels of society, people will increasingly have to turn data and information into usable computational forms in order to understand it at all. For example, one could imagine a form of *computational* journalism that enables the public sphere function of the media to make sense of the large amount of data which governments, amongst others, are generating, perhaps through increasing use of 'charticles', or journalistic articles that combine text, image, video, computational applications and interactivity (Stickney, 2008). This is a form of 'networked' journalism that 'becomes a non-linear, multi- dimensional process' (Beckett, 2008: 65). Additionally, for people in everyday life who need the skills that enable them to negotiate an increasingly computational field – one need only think of the amount of data in regard to managing personal money, music, film, text, news, email, pensions, etc. – there will be calls for new skills of financial and technical literacy, or, more generally, a *computational literacy* or *computational pedagogy* that the digital humanities could contribute to.

Humanity and the humanities

As the advantages of the computational approach to research (and teaching) become persuasive to the positive sciences, whether history, biology, literature or any other discipline, the ontological notion of the entities they study begins to be transformed. These disciplines thus become focused on the *computationality* of the entities in their work.[11] Here, following Heidegger, I want to argue that there remains a location for the possibility of philosophy to explicitly question the ontological understanding of what the computational is in regard to these positive sciences. Computationality might then be understood as an ontotheology, creating a new ontological 'epoch' as a new historical constellation of intelligibility. The digital humanists could therefore orient themselves to questions raised when computationality is itself problematized in this way (see Liu 2011).

With the notion of ontotheology, Heidegger is following Kant's argument that intelligibility is a process of filtering and organising a complex overwhelming world by the use of 'categories', Kant's 'discursivity thesis'. Heidegger historicizes Kant's cognitive categories by arguing that there is 'succession of changing historical ontotheologies that make up the "core" of the metaphysical tradition. These ontotheologies establish "the truth concerning entities as such and as a whole", in other words, they tell us both what and how entities are – establishing both their essence and their existence' (Thomson, 2009: 149-150). Metaphysics, grasped ontotheologically, 'temporarily secures the intelligible order' by understanding it 'ontologically', from the inside out, and 'theologically', from the outside in, which allows the formation of an epoch, a 'historical constellation of intelligibility which is unified around its ontotheological understanding of the being of entities' (Thomson, 2009: 150). As Thomson argues:

> The positive sciences all study classes of entities… Heidegger… [therefore] refers to the positive sciences as 'ontic sciences'. Philosophy, on the other hand, studies the being of those classes of entities, making philosophy an 'ontological science' or, more grandly, a 'science of being' (Thomson 2003: 529).

Philosophy as a field of inquiry, one might argue, should have its 'eye on the whole', and it is this focus on 'the landscape as a whole' which

distinguishes the philosophical enterprise and which can be extremely useful in trying to understand these ontotheological developments (Sellars, 1962: 36). If code and software are to become objects of research for the humanities and social sciences, including philosophy, we will need to grasp both the ontic and ontological dimensions of computer code. Broadly speaking, then, this paper suggests that we take a philosophical approach to the subject of computer code, paying attention to the wider aspects of code and software, and connecting them to the materiality of this growing digital world. With this in mind, the question of code becomes central to understanding in the digital humanities, and serves as a condition of possibility for the many computational forms that mediate out experience of contemporary culture and society.

Endotes

[1] HTML is the HyperText Markup Language used to encode webpages. AJAX is shorthand for Asynchronous JavaScript and XML, which is a collection of client side technologies that enable an interactive and audio-visual dynamic web.

[2] I am indebted to Alan Finlayson for his comments on this section.

[3] For example in *The Idea of a University* (Newman, 1996) and *Culture and Anarchy* (Arnold, 2009).

[4] See http://www.bcs.org/server.php?show=nav.5829

[5] What Heidegger calls 'the Danger' (*die Gefahr*) is the idea that a particular ontotheology should become permanent, particularly the ontotheology associated with technology and enframing (see Heidegger 1993).

[6] See Thomson (2003: 531) for a discussion of how Heidegger understood this to be the role of philosophy.

[7] Kirschenbaum argues:

> I believe such trends will eventually affect the minutiae of academic policy. The English

> department where I teach, like most which offer the doctorate, requires students to demonstrate proficiency in at least one foreign language. Should a graduate student be allowed to substitute demonstrated proficiency in a *computer-programming language instead*? Such questions have recently arisen in my department and elsewhere; in my own case, almost a decade ago, I was granted permission to use the computer language Perl in lieu of proficiency in the second of two languages that my department required for the Ph.D. I successfully made the case that given my interest in the digital humanities, this was far more practical than revisiting my high-school Spanish. (Kirschenbaum 2009, emphasis added)

[8] This does not preclude other more revolutionary human-computer interfaces that are under development, including haptic interfaces, eye control interfaces, or even brain-wave controlled software interfaces.

[9] See http://www.thecomputationalturn.com/

[10] See the open digital humanities translation of Plato's *Protagoras* for a good example of a wiki-based project, http://openprotagoras.wikidot.com/

[11] Here I don't have the space to explore the possibilities of a transformation of the distinction between research and teaching by digital technologies, themselves a result of the Humboldtian notion of the university. We might consider that a new hybridized form of research-teaching or teaching-research might emerge, driven, in part, by the possibility of new knowledges being created and discovered within the teaching process itself. This would mean that the old distinctions of research as creative, and teaching as dissemination would have to change too.

References

Arnold, M. (2009) *Culture and Anarchy*. Oxford: Oxford University Press.

Baker, N. (1996) *The Size of Thoughts: Essays and Other Lumber*. New York: Random House.

Baker, N. (2001) *Double Fold: Libraries and the Assault on Paper*. New York: Random House.

Beckett, C. (2008) *Supermedia: Saving Journalism So It Can Save the World*. London: Wiley-Blackwell.

Benjamin, W. (1992) 'Theses on the Philosophy of History', in *Illuminations*, trans. H. Zohn. London: Fontana, 245-55.

Berry, D. M. (2011) *The Philosophy of Software: Code and Mediation in the Digital Age*. London: Palgrave Macmillan.

Clement, T., Steger, S., Unsworth, J., & Uszkalo, K. (2008) 'How Not to Read a Million Books', accessed 21 June 2010 http://www3.isrl.illinois.edu/~unsworth/hownot2read.html#sdendnote4sym

Fuller, M. (2006) 'Software Studies Workshop', accessed 13 April 2010 http://pzwart.wdka.hro.nl/mdr/Seminars2/softstudworkshop

Fuller, M. (2008) *Software Studies: A Lexicon*. Cambridge, MA: The MIT Press.

Fuller, S. (2006) *The New Sociological Imagination*. London: Sage.

Fuller, S. (2010) 'Humanity: The Always Already – or Never to be – Object of the Social Sciences?, in J. W. Bouwel (ed.), *The Social Sciences and Democracy*. London: Palgrave.

Hayles, N. K. (2011) 'How We Think: Transforming Power and Digital Technologies', in D. M. Berry (ed.), *Understanding the Digital Humanities*. London: Palgrave.

Heidegger, M. (1993) 'The Question Concerning Technology', in D. F. Krell (ed.), *Martin Heidegger: Basic Writings*. London: Routledge, 311-41.

Hofstadter, R. (1963) *Anti-Intellectualism in American Life*. USA: Vintage Books.

Kirschenbaum, M. (2009) Hello Worlds, *The Chronicle of Higher Education*, accessed 10 Dec. 2010, http://chronicle.com/article/Hello-Worlds/5476

Kuhn, T. S. (1996) *The Structure of Scientific Revolutions*. Chicago: Chicago University Press.

Lakatos, I. (1980) *Methodology of Scientific Research Programmes*. Cambridge: Cambridge University Press.

Latour, B. (1986) 'Visualization and Cognition: Thinking with Eyes and Hands', *Knowledge and Society*, vol. 6, 1-40.

Latour, B. (2010) 'Tarde's Idea of Quantification', in M. Candea (ed.), *The Social After Gabriel Tarde: Debates and Assessments*. London: Routledge.

Lazer, D. *et al*. (2009) 'Computational Social Science', *Science*. Vol. 323, issue 5915 (6 February): 721-723.

Levy, P. (1999) *Collective Intelligence*. London: Perseus.

Liu, A. (2011) Where is Cultural Criticism in the Digital Humanities?, accessed 15 Dec. 2011 http://liu.english.ucsb.edu/where-is-cultural-criticism-in-the-digital-humanities/

Manovich, L. (2008) *Software takes Command,* accessed 3 May 2010 http://lab.softwarestudies.com/2008/11/softbook.html

Manovich, L. & Douglas, J. (2009) 'Visualizing Temporal Patterns In Visual Media: Computer Graphics as a Research Method'. Accessed 10 October 2009 http://softwarestudies.com/cultural_analytics/visualizing_temporal_patterns.pdf

McCarty, W. (2009) 'Attending from and to the Machine, accessed 18 September 2010 http://staff.cch.kcl.ac.uk/~wmccarty/essays/McCarty,%20Inaugural.pdf

Montfort, N. & Bogost, I. (2009) *Racing the Beam: The Atari Video Computer System*. Cambridge, MA: MIT Press.

Moretti, F. (2007) *Graphs, Maps, Trees: Abstract Models for a Literary History*. London: Verso.

Nature (2007) 'A matter of trust', *Nature.* 449 (11 October), 637-638.

Newman, J. H. (1996) *The Idea of a University*. Yale: Yale University Press.

Presner, T. (2010) 'Digital Humanities 2.0: A Report on Knowledge', accessed 15 October 2010 http://cnx.org/content/m34246/1.6/?format=pdf

Readings, B. (1996) *The University in Ruins*. Cambridge, MA: Harvard University Press.

Schnapp, J. & Presner, P. (2009) 'Digital Humanities Manifesto 2.0', accessed 14 October 2010 http://www.humanitiesblast.com/manifesto/Manifesto_V2.pdf

Schreibman, S., Siemans, R., & Unsworth, J. (2008) *A Companion to Digital Humanities*. London: Wiley-Blackwell.

Sellars, W. (1962) 'Philosophy and the Scientific Image of Man'. In: R. Colodny (ed.), *Frontiers of Science and Philosophy*. Pittsburgh: University of Pittsburgh Press, 35-78.

Sterling, B. (2010) 'Atemporality for the Creative Artist', *Wired*, accessed 1 July 2010 http://www.wired.com/beyond_the_beyond/2010/02/atemporality-for-the-creative-artist/

Stickney, D. (2008) Charticle Fever, *American Journalism Review*, accessed 18 March 2010 http://www.ajr.org/Article.asp?id=4608

Terras, M. (2010) 'Present, Not Voting: Digital Humanities in the Panopticon', accessed 10 July 2010 http://melissaterras.blogspot.com/2010/07/dh2010-plenary-present-not-voting.html

Thomson, I. (2003) 'Heidegger and the Politics of the University', *Journal of the History of Philosophy*. Vol. 41, no. 4: 515–542.

Thomson, I. (2009) 'Understanding Technology Ontotheologically, Or: the Danger and the Promise of Heidegger, an American Perspective', in Olsen, J. K. B, Selinger, E., and Riis, S. (eds.) *New Waves in Philosophy of Technology*. London: Palgrave.

Turing, A. M. (1950) 'Computing Machinery and Intelligence', *Mind*, Oct. 1950: 433-60.