Digital making/reasoning

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Willard McCarty
Digital Humanities
King's College London & University of Western Sydney
(www.mccarty.org.uk)

> Since its first calculations for the A-bomb, the computer has become an object on which whole societies rely on many different levels: from typing and saving a simple text to controlling flights of airplanes to avoid collision. Despite its omnipresence, however, many people have no clue about what lies beyond the interface. Not knowing what one is using, while heavily depending on it, can at least be called a disquieting thought.
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> Liesbeth De Mol, "Post's Machine" (2006-7)

1. Many clarities and mine

Whether there is such a thing as "digital knowledge", if so what kind of a thing it is, how it is to be known, whether these are the right questions to be asking or whether the words of that quoted phrase are the ones to steer by – these are questions asked and answered within particular disciplinary contexts. Each of these contexts shapes the clear water we strive for, or perhaps more accurately, determines its own clarity. Our position "on the edge of things in a great ring of viewers" (Dening 1998: 183) will, I hope, lead to many clarities.

My disciplinary context is digital humanities. But since that label is used too variously to be of much use for our purposes, let me make explicit what I take to be the basics for our discussion, then develop a brief argument from them. These basics are, simply, these: the digital machine; the interpretative practices of the humanities and nearby social sciences; and the crucial intersection or collision of those two.

2. Digital machinery

By the first, the digital machine, I mean the physical device we have as it has been realized through John von Neumann's architecture (1993/1945) from Alan Turing's abstract machine (1936/7). In other words, I put strong emphasis on *digital* as opposed to *analogue* forms of representation, stress that both are artificial schemes and pay close attention to the algorithmic

manipulation of digital data. Were we at some point to have machinery based on another design than digital, say quantum computing, whatever that turns out to be, we would have new problems, but I would argue that we (more likely our descendants) would still be dealing with the intersection of two very different ways of construing the world, ours and our machine's in co-creative interaction.

My emphasis on physical machinery means that I begin very differently from e.g. Brian Cantwell Smith, for whom the genius of the digital computer is that it makes specifically digital representation irrelevant (2005). I agree that we can take the digital form of representation to be irrelevant and use the term "digital" to label the unexamined operations of a black box. In a trivial sense, we can simply experience what the machinery produces, e.g. music, video and so forth. We can follow its effects on people and cultures. We can, as we should, study the effects on us of what I call curiosity's networked machine and its vast resources. (I will return to this later.) We can, as we should, direct attention to how we do research now, given the interdisciplinary deluge from JSTOR et al., indeed what we take research and its outcomes to be; or, even more to the point, what we mean by knowledge, e.g. when the thing studied is a simulation, as in computational physics. We can, as we should, observe that, in Paul Humphreys' words, "scientific epistemology is no longer human epistemology" (2004: 8), or as Gabriele Gramelsberger has summarized from several voices at the 2007 Blankensee Colloquium, that new scientific models and theories must be "conceived *from their conception* as computable" (2011: 12, my emphasis) – by which she may also have meant, "*in* their conceiving". We can and must then ask, what about the humanities and social sciences?

I will return also to the question of the sciences later – specifically to why and how we need to pay attention to them. For now I want to focus on the digital machine.

The physical properties of computing machinery are important for many reasons, e.g. what is practical to do in the time we have, how we do it and how we interrelate with the machinery, e.g. whether it is embodied in anthropomorphic form, and so what its psychological, social and cultural effects are. Size matters in profound ways, as von Neumann realized in *The Computer and the Brain* (1958). But for the interpretative practices of the humanities and social sciences, the key dilemma is posed by the problem of representing, specifically digital representing, which the machinery enforces. In order to do anything useful at all, a computing machine must contain a representation or *model* of something (Smith 1995/1985). Given the fundamental constraints of digital representation, this model cannot be otherwise than a completely explicit and absolutely consistent rendering of

the chosen object. Simplification, i.e. partial falsification, of the object is inevitable. The tradeoff is vastly increased manipulability. In other words, the point is not the model but the *modelling* that then ensues.

Modelling takes three forms: (1) *of* a pre-existing phenomenon as conceived by the modeller, with the aim of exploring his or her conception of it; (2) *for* an emergent phenomenon through construals of it; or, (3) *as* that which itself is studied. The third kind is more properly called simulation, employed to replace an imperfectly observable phenomenon or to formulate a counterfactual one (see Galison 1996).

In the sciences once a mathematical model is perfected it can become virtually indistinguishable from a theory and have a long shelf-life. Digital models, however, are by nature enacted and manipulable; in use they change and develop. They instantiate not so much the "thing knowledge" of traditional tools and instruments (Baird 2004) but a *knowing*, or perhaps better, a *coming to know* for which they provide a set of affordances. Modelling-*of* aims at the question of how we know what we know through the failures of successive models to reproduce it; these failures drive better reasoning (McCarty 2005: 20-72). Modelling-*for* is experimental in David Gooding's sense (1990), as my prior use of his word "construal" suggests. Both may be brought to an end but, as Peter Galison's *How Experiments End* (1987) suggests, not necessarily because they have reached epistemic closure. Particular simulations (modelling-*as*), especially in the sciences, can survive a very long time, though they are more happenings than things, and their manipulation is, I would think, essential to their epistemic uses.

Attention to digital *knowing* rather than digital *knowledge* thus comes from popping open the computational black box and following the reasoning processes rather than observing its effects on us near and far. Typically in the textual humanities, digital knowing is what happens when, for example, a scholar encodes a text by adding computationally tractable metalanguage and so must think digitally, hence attempt to resolve human language into completely explicit and absolutely consistent expressions. In the visual humanities, for example, much the same battle is fought algorithmically in the attempt to identify what we mean by "similar" shapes. Usable, valuable products are left behind, but the knowing continues, I would think indefinitely.

3. Three effects of it

Now I want to turn from digital knowing itself to three strong effects on our epistemological practices offering possibilities for clear water: those (1) from

the use of a techno-scientific instrument in the humanities; (2) from the resources for scholarship unleashed by curiosity's networked machine; and (3) from the "looping effects" of our digital inventions.

3.1 Scientific reasoning in the humanities

The presence in the humanities of the digital instrument unsurprisingly suggests if not a Trojan Horse then a bridge potentially joining the two cultures. In either case I suggest it is worth considering further the kinds of reasoning implicit in the device as we have it – again, not thing-knowledge but thing-knowing. Here Ian Hacking's work on what he has called "the styles of scientific reasoning" (2002) gives us a useful way of identifying the kinds historically observable in the sciences that have already arisen quite autonomously in the digital humanities. I have suggested Experiment (in the autonomous form Hacking and others have explored), but we can also observe Hacking's Laboratory style, in the collaborations characteristic of the field; the Modelling style, which I have explored here; Statistics, in increasingly successful computational stylistics as well as in various "data mining" and "distant reading" projects; Taxonomy, expressed primarily in the construction and use of ontologies; and Derivation, in attempts to reconstruct e.g. manuscript stemmata.

Elsewhere I have proposed that the presence of these styles in the humanities via digital computing points to an implicit conjectural space within which cultural objects are reductively treated as if they were natural objects. The basic idea is that in this space, data being data wherever these data come from, the great disciplinary divide is a matter of indifference (McCarty 2007). The styles apply wherever they fit the circumstance; how we interpret the results is, of course, a matter for the discipline concerned to say.

Apart from the services rendered by digital research to the other disciplines, this conjectural space not only brings into focus the fact of digital knowing but problematizes the ways we have for coming to know, i.e. reason itself.

3.2 Evidence

There is a pronounced though rough parallel we can observe among these recent developments: the return of curiosity to the cultural limelight (Daston 2005); explicit interest in interdisciplinary research (Frodeman et al. 2010); and the rise of online communications. These three are not, I suggest, causally interconnected but separate indications of something happening where it can. At work are interests, as Daston and Park say in *Wonders and the Order of Nature 1150-1750*, "risen to prominence on a wave of suspicion and self-doubt

concerning the standards and sensibilities that had long excluded them (and much else) from respectable intellectual endeavours" (1998: 10). In a brief commentary on a sentence from Gadamer, Richard Rorty makes sense of the change by arguing for a new (or revived?) epistemology: one that emphasizes going wide to collect many witnesses rather than going deep to reach an essence (2004/2000). Whatever else may be said about that, Rorty's argument does seem to describe what is happening, via online mechanisms (I have already mentioned JSTOR and its kind) likely to confront the bemused researcher with numerous unexpected and sometimes exotic connections. Ironically, the immediate explanation is the failure of classical "information retrieval" techniques to bridge the disconnect between the meaning we seek and its encoding in character-strings. Google *et al*. are more successful at the retrieval game by following what we do individually and socially rather than what we say we want in queries. But for the making of knowledge what matters, I think, is this default condition of 21st-century research: the centrifugal interdisciplinary pull from wherever you start outward into other "epistemic cultures" (Knorr Cetina 1991), mind-expanding as you go.

I leave the question of how to do interdisciplinary research alone (see McCarty 2014). I note, however, a moral to be drawn from the fact that the technical causes are not immediately very interesting. Years ago Joseph Weizenbaum pointed out that the most important consequences of a technological innovation may easily be overlooked as a mere side effect (1972) – or as Robert Jervis added later, correcting Weizenbaum's prejudice, "disturbing a system will produce several changes", and only our desires determine which are main, which side effects (1996: 10). We look in the wrong place, or at least the technically inclined tend to. Or, to return to something I said earlier, when we look with sociological eyes only, that which the digital epistemologist finds riveting almost entirely disappears.

3.3 Looping effects

The phrase is Hacking's (1995). I use it with some license to suggest the notion popularized by Marshall McLuhan ("First we build the tools, then they build us") and often described metaphorically as a co-evolution of humans and their inventions (cf. Donald 1991). This, please note, is *not* the "impact" of the latter on the former but their ongoing interdependent influence on each other. The literature on the topic is substantial, but as far as I know (always a serious qualification) very little attention has been paid to it for the cyclical interrelation of digital machinery and human cognition (McCarty 2012: 30-2). My point here is that we could pay specific attention to this interrelation as it is observable at the level of actual work in the interpretative disciplines.

4. A parting note on strategy

Digital humanities in its broadest sense exhibits two tendencies to swerve from the intersection I have described. These have been popularly described as the dilemma of "hacking" vs. "yacking", i.e. on the one hand, technically competent practical work that has little direct engagement with the concerns and intellectual traditions of the older disciplines, and on the other, observation and thought about effects and implications of digital media informed by those disciplines but deprived of the *Fingerspitzengefühl* and creative constraints of practical work. Both can and must be done well, but the greatest potential here is to work together toward a realization of Leibniz's vision, *Theoricos Empiricis felici connubio zu conjungiren*, "to join theorists and empirics in a happy marriage" (Burke 2000: 16f). There are very few centres of activity where the marriage is even contemplated, and so the transformative relation between the two remains mostly *in potentia*.

Given our circumstances it is not difficult to assemble learned colleagues from the older disciplines. The challenge, I suspect, is to find the right sort of technologically educated participants. Perhaps here is a role for doctoral students attracted by funding and by the chance to work with the distinguished people affiliated with the Centre.

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