Machines of Demanding Grace

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> But who can say that the vapour engine has not a kind of consciousness? Where does consciousness begin, and where end? Who can draw the line? Who can draw any line? Is not everything interwoven with everything? Is not machinery linked with animal life in an infinite variety of ways?
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> Samuel Butler, *Erewhon* (1924/1874: 237), from *The Book of the Machines*

Computing is now widely accepted in the humanities as a way of doing and communicating research. It is difficult to know with any certainty, or at all, which of the far-reaching claims made for its effects will fulfilled, to what degree and in what sense. But, as for now, I find one question concerning its future most troubling because it is so much at the margin of our concerns, namely, what about the core activity of the humanities, interpretation? If one bothers to look closely, it becomes quickly evident that the more research has to do with interpreting rather than presenting objects for study, the less computing itself has to offer. Other than as a means for fetching, organizing and delivering things to the desktop, Fr Roberto Busa's sentence in 1976, echoed by Jerome McGann in 2004, stands: computing as we know it performs rather poorly. Its abilities remain weak and limited in comparison to the questions the disciplines ask and have always asked.

Actually there are two problems here, or rather one problem, as old as the digital humanities itself, involving a standoff across a cultural "beach of the mind" (Dening 2004): on the one side, the interpretative practices of the humanities, mostly tacit, sometimes methodical but not methodological; on the other, the "machine for doing thinking" (Mahoney 2011: 87), which is impotent if not explicitly instructed and nothing if not methodological. In his 2004 assessment McGann, echoing commentary stretching back to the mid 1960s, suggested that the way to improve the situation for literary computing was to bring our computationally operative idea of text out into the open and rethink it with the benefit of whatever theoretical light might be available. But there the effort has faltered. On the one hand we lack the language in which to state literary theories as computational procedures or to devise procedures that would answer to such theories; on the other hand (with one great exception, to which I will return) what we can state is pitifully rudimentary, yielding for example

clues to the meaning of a text from the proximity and frequency of its words, or computationally tractable descriptions of its hierarchical structures, such as chapters, paragraphs and sentences. The immersive research environments of artificial intelligence, which by means of motion-capture equipment place the researcher within an interactive simulation, show promise for disciplines that focus on objects of material culture, but these environments bypass language altogether and tell us nothing analytically: they are too much *participant*, not enough *observer*. In disciplines for which material things are secondary to their interpretative uses and language primary, the next step is simply unknown. It has been an unanswered question from the beginning, as I will briefly indicate later; it remains so today.

I want to argue that as far as computing is concerned the answer, or at least the beginnings of an answer, has been with us all along and can be found in the here-and-now, with the equipment that we have. I want to argue that it lies with the prior question of how computing might be regarded as a close participant at the level of minute and particular interpretative acts. I want to argue that this question points to the experimental style of working that computing has given us, and so to "a distinct form of reasoning – a form of reasoning not reducible to inspiring theory or to checking after the fact", as Peter Galison has written of experimental science (2010: 26). And this raises a psychological question prior to that one: what gives a *computational* result its peculiar force when it surprises, and sometimes causes us to change our minds, or when it confirms what we already think and so builds confidence – when, that is, it acts in the place of a critical interlocutor? What happens in such moments? And as this (whatever it is) is happening, if it does, with what are we becoming aligned? For as humans in process of being we do not, cannot stand still; our "going-on being", as Anthony Giddens calls it, "involves constant and unremitting work" of tacit self-construction powered by a seldom conscious sense of our own identity's fragility (1991: 61). And this is not, he shows, a one-off adjustment to reality but an anxious, moment-by-moment adaptation to a world in perpetual identity-threatening flux.

There are strong arguments, to which I will return, to the effect we are adapting at an increasingly intimate level to an increasingly computerized world. But, alas, at the same time, we in the humanities tend on the whole to continue to act as if our relation to computing were analogous to that old, long rejected social model of master and servant. We think of computing as an appliance rather than an affordance. And so, as has happened so often in the past, we are unable to see the relationship critically because we are so dependent on it. Putting something in the role of servant that has shown itself elsewhere to be so powerful and adaptable cannot, I think, be the wisest course of action.

The error was noticed as early as 1971, in a review of two books on the social impact of computing. Systems scientist Sir Charles Geoffrey Vickers argued at the close of his review that the intellectual potential of the machine was to help to resolve "the major epistemological problem of our time", as he put it, by distinguishing between its rule-following and our role-playing behaviours. This potential would be buried, he said, by succumbing to the "dangerously strong" temptation to regard computers

as "slave labour". We may now have computers as servants rather than slaves (Scarrott 1979; Brandstetter 2012; cf Krajewski 2010), but the effects are much the same: we lose contact with that level of reality at which the realities presented to us by computing are made. At that level, I argue, is where our critical intelligence must operate, as a craftsman uses tools rather than as a client is serviced.

The strong arguments to which I just referred, urging discontent with the status quo shaped by computing's relegation to servitude, are not difficult to find – indeed, there is a chorus of them. The most obvious of the provocations to discontent is the increasing capability of these machines, which are based on Alan Turing's open-ended scheme that allows for as many forms of symbol-manipulation as we can imagine. So, of course, the burden is on us. The trajectory of computing's development clearly foreshadows something like collaboration rather than mere servitude (Shrager 2010; Goodrich and Schultz 2007), raising the question of what our research might want of collaborating agents when they arrive, and prior to that, how it might inform their development. In philosophy and cognitive science we find compelling theories of mind that extend intelligence out into the world, and so blur the distinction between thought and action, words and things, scholar and machine (Clark 2011). The question for us is, how might we take advantage of that blurring? Historical studies of the relation between technological inventions and physiological language on the one hand and research into neurological plasticity on the other suggest that in the larger theatre of mind, embodied and extended, we co-evolve with our inventions (McCarty 2012: 30-2). Anthropology, history, sociology and other human sciences show that such evolution at the level of human identity is and has always been a central human activity, although modernity seems to have accelerated the pace and scope of it (Lloyd 2012; Inwood and McCarty 2010; Giddens 1991).

Asking what kind a thing we are in relation to everything else is so old a question and so widespread across cultures as to beggar cataloguing. The conventional beginning is with Plato's Socrates, "who… founded a humanism based on 'anthropological difference'" from everything else in nature (Chateau 2011/2004: 11). I will get back to him. An indication of how seriously the question of difference has been taken subsequently can be found in Immanuel Kant's division of all philosophy into four questions: metaphysical ("What can I know?"), moral ("What ought I to do?"), religious ("What may I hope?") and anthropological ("What is man?"). All can be reckoned as anthropology, Kant concluded, "because the first three questions relate to the last one" (Kant 1992/1800: 538). Roger Smith's *Being Human: Historical Knowledge and the Creation of Human Nature* (2007) brings the asking of the anthropological question up to the present. So it seems reasonable to expect, as the debate surrounding artificial intelligence has never stopped suggesting, that an invention as disturbing and successful as computing has proven itself to be would stir up the anthropological question and keep it stirred up, prompting us to turn and return to it. And yet, in the digital humanities, we have mostly ignored it. My argument here is that with this question we find the power of computing for the humanities most completely and compellingly realised. Nor can computing's form of it be ignored by those with no interest in the digital humanities, for (as I will argue

more fully later) computing has become so embedded in how we deal with and understand the world that computing's anthropology is everywhere we turn.

The wherewithal that would allow the digital humanities to develop a critical perspective on computing's effects seems (as I have briefly hinted) to be answered by multiple voices. Together they indicate that the key lies in how we conceptualise the *inter*relation of interpreter and interpreted, with (as I suggested) an parallel to craftsman and tool that phenomenological accounts bring out. But although collegial help is at hand, it is help by means of analogies with other disciplined ways of thinking. Analogies, we know, are by definition not true but helpful in proportion to their strength, so we must examine each of those proposed or implied in that light. Let me give a particularly obvious example of what I mean. Cognitive philosopher Andy Clark, in his book on the theory of cognition in and with the world, *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*, describes this interrelation in terms of "inextricable tangles of feedback, feedforward, and feed-around loops: loops that promiscuously criss-cross the boundaries of brain, body, and world" (2011: xxviii). His barely implicit analogy, stated in the language of Norbert Wiener's cybernetics, would seem most helpfully to equate the interrelation of interpreter and interpreted with a well-understood kind of system that maintains equilibrium between a human who controls and machine that responds – in simplest terms, like a thermostat, or closer to Wiener's wartime research, like the Sperry "ball turret" of World War II. **– [SLIDE 4]—** It seems at first quite an appealing analogy – cybernetics once was on its way to becoming the universal science, of "control and communication in the animal and the machine", as Wiener subtitled his foundational book (1948). But the weakness of this analogy poses a rather large problem: the idea of humanity that it implicitly asks us to take on. In Evelyn Fox Keller's words, it gives us man as "a machine of the twentieth century, a cybernetic machine par excellence: absolutely autonomous, capable of constructing itself, maintaining itself, and reproducing itself" (1991: 85). It thus gives us the undesirable and unsupportable fiction of an isolated, self-sufficient interpreter, one with no reference to society and to Bakhtin's "world of other's words" past or present. In its origins, from Wiener's wartime research into the urgent anti-aircraft problem, it also gives us, in Galison's brilliant analysis, "the essential and unrelieved reality [of a world in which] the individual [lives] in isolation, struggling (searching for tactics) to create order out of chaos", making "an angel of control and a devil of disorder" (1994: 266). It gives us, as Galison entitled his article, the "ontology of the enemy".

We need our enemies and their ontologies to know who and what we are, but we must also be in a position of strength so as not to be overcome by them. In disciplinary terms, that is, we must know the history of the digital humanities so as to know where it is coming from, with what momentum, and so be able to make a strong case for it by charting its proper trajectory into the near future.

For purposes of convenience this history may be partitioned roughly into three periods, the first two divided by the invention and spread of the Web in the 1990s, the third defined by rapid growth of the digital humanities as a self-consciously academic practice within the last decade – let us say, since the publication of the first

comprehensive collection of essays, the Blackwell's *Companion to Digital Humanities* (Schreibman, Siemens and Unsworth 2004), and the first theoretical treatment of the field, *Humanities Computing* (McCarty 2005). The Web for obvious reasons turned attention away from the early struggles of a small, scattered and professionally isolated group of scholars, mostly (though not in the least entirely) in literary studies. As a result of the Web their struggles have largely been forgotten. But the ante-diluvian or incunabular period of the digital humanities is of immense value to the historian because quite basic problems concerning the role of computing in scholarship were openly debated then: computing was new, practitioners didn't quite know what to make of it. I am convinced from the popular cultural literature of the time that the tensions of the Cold War, which was almost exactly coincident with the incunabular years of computing in the humanities, sensitized scholars to the implications of computers – remember, computers then were expensive, rebarbative, sequestered mainframes tended by (to use a metaphor popular at the time) a priesthood of white-coated technicians who had sole access to the oracular machine. **–[SLIDE 5-7]—**In an age when both adults and children were being actively prepared for nuclear attack, when war was more than once almost started by computer errors – for example, on 5 October 1960, when an American early-warning system falsely identified a lunar reflection as Soviet missles headed for the U.S. and almost launched a massive counter-attack (Smith 1985) – computing's prominent role in defence and retaliatory systems made it a fearful, fear-evoking device.

Practitioners in the humanities were, I said, professionally isolated. Although computing in commerce, military applications and scientific research grew at an enormous (to some alarming) rate from the 1950s on, the work of those scholarly practitioners was simply "neglected, not rejected" by the mainstream, Rosanne Potter wrote in 1989. They complained often, some of them with great insight, from Cambridge philosopher and linguist Margaret Masterman's observation in 1962 that "the digital computer has been thought of as a purely menial tool" rather than the "telescope for the mind" which, she said, it could become; to literary scholar Louis Milic's severe criticism in 1966, of colleagues' imaginative failure; pioneer computational philologist Fr Roberto Busa's sentence of a "rather poor performance" in 1976, to which I referred earlier; and so on into the 21st Century, e.g. in 2004, McGann's theoretically elaborated argument for a radical revision of ideas about text. Potter put her finger on the matter in her 25-year retrospective in 1991, as the Cold War was ending, in which she concluded that theoretical poverty had crippled efforts across the board. As Milic had said in his biting critique at the very beginning of the period Potter surveyed, "We are still not thinking of the computer as anything but a myriad of clerks or assistants in one convenient console" (1966: 4) – again, in a relation of servitude to a user. Is it any wonder that an American assistant professor has organized a panel for the 2013 conference of the Northeast Modern Language Association in the U.S. to debate the fact that digital humanities scholarship "has not significantly influenced the vast body of literary scholarship", or that the editor of a major American journal in literary studies has recently referred to "this exciting – but

to many, daunting – new direction"?[1] **– [SLIDE 8] –**

Considering the primitive equipment of the time, we might be inclined to blame the technology, but at least for literary, historical and other textual disciplines sufficient *matériel* had been available "since the early 1960s and 1970s" (Rommel 2004: 93). As I suggested, the physical and social circumstances of mainframe computing, alien to the humanities, did shape how people thought about computing (McCarty 2009); small, personally owned and operated computers did make a difference. It is also true that from earliest times, often in conversations with programmers, practitioners had the opportunity to confront the minute and practical encounters of algorithmic processing and human reasoning, and so to see beyond the idea of computing as a mere service to scholarship. If my experience is indicative, they sometimes did, and they still do. But again the evidence up to the present day suggests a stronger contrary: witness the language of "delivery", the dominant emphasis on infrastructure and the notion of an "end-user".

It has been fashionable to refer to computing in the humanities and human sciences as "knowledge engineering" – an amusing conceit that would lead us in the direction we need to go if only the violence of the metaphor were taken seriously. But mostly it isn't. Mostly it is implicitly taken as if it were a description of what the digital humanities actually does, and so becomes what most in the digital humanities actually do. Mostly the impulse to theorise moves away to the products of this putative engineering, to the media it constructs and to the behaviours these media shape, with considerable stimulus to comparative, historical, material and formal studies of them. There are exceptions. Since McGann's study to which I have referred, scholars in the digital humanities have begun to address the problem of interpretation theoretically, e.g. Melissa Terras, who has described an inching forward in a recursive process from signal processing toward an historiographical cognition (2006); Matthew Kirschenbaum, by describing "the forensic imagination" at work in the study of digital media in much the same way as the textual editor works (2008); Stephen Ramsay, by showing how text may be read with and through programming (2011); and Stan Ruecker, Stéfan Sinclair and Milena Radzikowska, by focusing on interaction design (2011). But, as I said earlier, what I propose to do is different. Setting the digital humanities into the context of research in the *literae humaniores* as a whole, I want to consider the generic significance of confrontations that computing brings about between a computational result and a human thought. I want to ask, how are these confrontations interpretatively provocative? I want to bring out the anthropological question that they provoke.

Some say that such fuss is transitory because soon all will be digital. This is actually a more serious assertion than might seem, as I hinted earlier. It surfaces in the cognitive and natural sciences as well as in the digital humanities. Not only is ever more sophisticated computing machinery disappearing into the infrastructure of

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[1] I am quoting from Ryan Cordell's posting to *Humanist* 26.257, www.digitalhumanities.org/humanist/Archives/Current/Humanist.vol26.txt (25 September 2012), and from private e-mail correspondence of 22 September 2012.

both ordinary and scholarly life, but computation is becoming inseparable from how we see and understand the natural world. Two examples, one from biology, one from physics. Quoting computer scientist Robin Milner on modelling the dynamics of the living cell, historian Michael Mahoney wrote in 2008 that, "Here the artefact as formal (mathematical) system has become deeply embedded in the natural world, and it is not clear how one would go about re-establishing traditional epistemological boundaries among the elements of our understanding" (2011: 179). Philosopher of science Paul Humphreys argues in *Extending Ourselves: Computational Science, Empiricism and Scientific Method* bluntly that "scientific epistemology is no longer human epistemology" (2004: 8). Should we be concerned on behalf of the humanities as computing methods and tools become the furniture of research and start to become the furniture of thought as well? How do we avoid smell-of-the-book, not-in-the-bathtub silliness? (E-book readers have already forced us to give up the at-the-beach variety of it.) My reply is that very much unlike the viewer of an insensibly digital image or musical recording, we locate our critical perspective in how the bits work, asking what are the bits and processes *not* doing that we do, or what do they do that we do differently? But, again, who is this *we* becoming at the urging of those bits?

A general note here on computing will help. Broadly speaking there are two fundamental kinds relating to computing as we currently know it. **– [SLIDE 9]—** Brian Cantwell Smith pointed out in 1985 that to do anything at all useful with a computer you have to choose some portion of the world you want to deal with and put a representation of it into the machine, i.e. by writing this representation into software that the machine runs (1985: 21-2). There are two sorts of representational operations you can then do: modelling and simulating.

Modelling is a kind of trial and error. You iterate the representation (or model) perfectively, comparing it to that portion of the world you have represented until you change your mind about how you see it or until the model proves fundamentally inadequate. In a variant of this, you imagine something, design a model of it, then iterate the model until you get it right – or give up. **– [SLIDE 10] –** In simulating something, normally a complex system such as the human body, you design a representation to fit everything you know about the system, then run it to see what happens that you cannot otherwise observe, perhaps under hypothetical or counterfactual conditions, e.g. experimental procedures impractical, unethical or impossible to perform. As far as I know simulation is seldom if ever done in the humanities because we do not know enough about cultural artefacts to describe how they work systematically in concert with the reader, viewer or listener. Again, the problem of interpretation.

In a previous book I argued that modelling scholarly objects and processes is the fundamental act of the digital humanities (McCarty 2005: 20-72). **– [SLIDE 11]--** Recently I have become unhappy with such a neat and widely accepted formulation, however. Troubling me is the strong tendency to content oneself with the assumption that computing will always ultimately fall short of what the human interpreter can do because as an instrument (we assume always) cruder than

ourselves, it requires the modeller deliberately to simplify and so to falsify the modelled object or process to some degree. This is, I still think, true as far as it goes, but it conceals a key assumption: that an absolute boundary exists which computing cannot cross, and because of the inviolable boundary, that presenting results for consideration and judgment is all that computing can ever do, full stop. Now perhaps that *is* all computing can ever do for the humanities analytically. But as far as we can tell there is no evidence either way. It is, then, a line drawn in the sand – a matter of belief. My interest is not in whether this belief is justified and true. I am interested in the fact that it is so energetically asserted again and again in the drawing and redrawing of it. **– [SLIDE 12] –**

One of the earliest examples I have found of this line being drawn in the digital humanities is in medievalist Franklin J. Pegues' 1965 review of the first conference in the field, held the previous year. Considering "the often mentioned hostility of the humanist toward the computer", he reassured his reader that, "The purpose of the machine is not to dehumanize the humanities but to free the humanist… by providing him with large and accurate masses of data that may be used by him in *the work which only he can accomplish*" (1965: 107, my emphasis).

There, in two interrelated rhetorical moves, we have the matter in a nutshell: a defence of the humanities against technoscientific conquest first by relegating the machine to drudgery, i.e. to the status of a servant or slave, then by drawing an absolute boundary separating human from machine. Pegues' strategy was neither rare at the time nor silly. Cornell literary historian and scholar Stephen Parrish, in his overview published in the proceedings of the conference on which Pegues reported, had proclaimed the beginning of a "quasi-scientific revolution" that was, he foretold, going to put an end to outdated, impressionistic and emotion-ridden practices of interpretation (1964: 4). Parrish described his attendance five years earlier at C. P. Snow's Rede Lecture ("The Two Cultures") in Cambridge, at which, Parrish said, Snow spoke with "a pungency and timeliness and force" that belied the "cool, if not hostile" reaction from "the assembled company of good gray dons" (1964: 3). Snow's portrait of youthful scientists with "the future in their bones" must have seemed to Parrish like the American reporter Lincoln Steffens' famous sentence after visiting Russia in 1919: "I have seen the future, and it works" (Hartshorn 2011: 315).

Actually, as we know, it didn't work. But it is quite curious that Parrish's revolution did not happen, that the "good gray dons" of American academia were as "cool, if not hostile" as their Cambridge counterparts, in a time when, especially in America, techno-science ruled. As a young Ronald Reagan proclaimed for the General Electric Corporation in 1961, "Progress is our most important product". **– [SLIDE 13] –** In his British Library lecture of 1992 Anthony Kenny cited classicist Robert Connor's observation that computers entered the scene precisely when scholarship was moving in the opposite direction, to the high ground of theory. Kenny speculates that scholars fled in dismay because they feared quantification (1992: 9-10); perhaps they feared more what quantification signified in those Cold War years. **– [SLIDE 14] –**

The battle over cliometrics waged by historians in the 1960s and 70s suggests much the same, though much more loudly and vividly (Thomas 2004: 56-8). Again for my purposes the significant facts are rhetorical: the blunt revolutionary pronouncements, such as Le Roy Ladurie's in 1973, that "Tomorrow's historian will have to be able to programme to survive" (1976/1973: 6), and even more, the passionate rejections. These include, for example, Gertrude Himmelfarb's moral repulsion in *The New History and the Old* (as Lawrence Stone put it in his 1987 review) and Carl Bridenbaugh's, who in his presidential address to the American Historical Association in 1962 shook a defiant rhetorical fist at "the shrine of that Bitch goddess, QUANTIFICATION" (1963: 326) and the "dehumanizing methods" that, you will recall, Pegues had noted were commonly feared in the humanities. Jacques Barzun, in *Clio and the Doctors* (1974), cast the threat in openly sexual terms, as "[t]he attempt to rescue Clio from pitiable maidenhood by artificial insemination" (14) and concluded his book with the prophecy that "in any new vale which the muses may elect for their abode, Clio will again be found among them, *virgo intacta*" (158). He was not the only one to sexualise cliometrics: those who coined the term in 1960 had jokingly named it "The offspring… of disciplinary miscegenation" (Davis, Hughes and Reiter 1960: 540); a decade later Clio was depicted "naked and trembling on the edge of quantification" (Fischer 1970: 104). But Barzun also saw in the drive to quantify a "contemporary search for a persuasive myth". He singled out J. H. Plumb's diagnosis of history's ills: "It is often not the numbers, the statistics that speak the truth," Plumb wrote, "rather there is a quicker acceptance of them in ourselves – almost an excitement" (1973: 64ff) triggered by an object of desire wanted for its own sake. But a desire for what, exactly?

Passions ran high both ways and, as Barzun's reviewer Robert Schulzinger remarked, the results could be capricious (1976: 100). But it would be a mistake to ignore abundant if florid evidence of upset in the professional lives of highly disciplined and usually sober academics. One must wonder what anxiety proportional to the outbursts was being awakened? In "Historians in white coats", for example, Oxford Professor of Modern History Richard Cobb, writing for the series "Thinking by Numbers" in the *Times Literary Supplement*, saw in the drive to quantification a "blind belief in the [reductive] Collectivization of Man" by "the dark mechanized forces of the Social Sciences, the Armies of the Night", whose strength attests to "a loss of faith in the merits of history as the study of people" and "one of the last barriers preserving our society from a total loss of both individual and national identity" (1971: 1529). It's that last word, identity, that I want to draw out.

To do that, allow me to turn the clock back to an early expression of disquiet provoked by autonomous machinery: engineer George Stibitz's first sight of Norbert Wiener's Anti-Aircraft Predictor in operation. **– [SLIDE 15] –** "[T]he behavior of their instrument is positively uncanny", Stibitz wrote in his diary. Historian Peter Galison comments that Stibitz uses the term *uncanny* "just at the moment – 1 July 1942 – when Wiener's machine began predicting as if it were animated" (243 n.37). Galison quotes Stanley Cavell's argument that "the uncanny reflects precisely the philosophical anxiety exacerbated by the ambiguity created when it is unclear whether a mind or merely an inanimate object is at hand". Galison adds that what

we regard as constituting a mind changes with time – as do the machines that appear uncannily mindful.

What does this tell us? Three things: first, the provoking stimulus is uncertainty of a close but not complete resemblance, as in Masahiro Mori's proposal of an "uncanny valley" in robotics, of creatures who are scary because they are in between, neither one thing nor the other (2012/1970). **– [SLIDE 16] –**; second, contrary to Mori, the reaction is not fixed to a particular stage of technological development but has to do with the historically contingent interrelation of human and machine; third, this interrelation is *for both human and machine* an ongoing process. Thus, for Cobb two decades later, quantification.

When debate about computing in the disciplines occurs now, it is much less fraught. I suggest that this isn't because we now understand what we are doing and so have put away childish rants. I suggest that familiarity with computing, buttressed by its usefulness and ubiquity, has dulled sensitivity to an intellectual challenge that remains as sharp and potentially corrosive (and useful) as ever.

In historical studies, for example, the shift from cliometrics (i.e. computing as calculating) to database management (computing as symbol manipulation) has not averted the problem of what data and algorithmic processing have to do with history, only made this problem harder to see. I would suppose it is less obvious because historians are more accustomed to sorting and structuring discrete chunks of text than to counting occurrences of things. But structuring data can be, and for history often is, an intensely interpretative act that in a mature database can be very difficult and costly to redo. So, in fact, it is as a general rule not redone. Similarly the marked-up texts of literary studies, the metadata in them expresses a interpretative theory of the text and can likewise be for practical purposes too laborious to change. Furthermore, both technological methods demand complete consistency and absolute explicitness of description, which tends to force intense hermeneutic struggle on a minute level of detail across a potentially large number of cases. There is nothing wrong with that. But the fact that the disabilities of our tools militate against changing such a resource once work is completed argues against using them as interpretative instruments, indeed blocks such use where we know how to engineer it. If, as I am arguing, the greatest value from the encounter of computing with scholarly enquiry comes from the struggle between the two, then we have a problem that calls for a combination of theoretical and practical design work.

I won't go any further here with the practical side of that problem. Rather, I want to draw out our continuity with those early post-war historians, their colleagues in literary studies and before them the wartime cyberneticists. Thus, today, the fright that artificial intelligence continues to stir up, and which AI researchers take quite seriously (Horvitz and Selman 2009; Markoff 2009; Wellman 2009); the daunting novelty, after more than 60 years, of computing to many in the scholarly mainstream; and, on occasion, the quite odd reassurance that, as A. K. Bowman and J. M. Brady recently declared in the Foreword to Melissa Terras' 2006 book, we may be helped by "systems that can aid, *but not replace*" us (vii, my emphasis). *We are not threatened!*,

they assert with Oxonian authority. But, o yes, we are. And that's the whole point.

To see this point in all its sharpness the most helpful arguments are those for which being human is something we do, not something previously determined that we are given to be, not something securely on our side of the line. Earlier I referred to Anthony Giddens' vivid depiction of the perilously negotiated process of "going-on being" in the reflexive construction of self (1991: 39). In *Modernity and Self-Identity*, he draws on the developmental psychologist D. W. Winnicott to argue further that identifying and repudiating the "not-me" – the enemy whom we need, the not-human automaton in this case – is part and parcel of how the autonomous self is formed and reformed (42). So also Giorgio Agamben's "anthropological machine", his metaphorical mechanism by which the human is continually generated. In *The Open: Man and Animal* (2004/2002), Agamben, for example, reads Linnaeus' designation *homo sapiens* not as intending a description but a simplification of the Socratic imperative, *nosce te ipsum* – hence denoting a creature in perpetual becoming. In *Being, Humanity, & Understanding*, looking across cultures and centuries, G. E. R. Lloyd writes that, "Being is not a given (however tempting it may be to assume it is) but a problem, and so too is humanity, that is, what counts as being human and on what grounds, and with what implications for how we should behave" (2012: 1). It is a problem perpetually being solved. In *Being Human: Historical Knowledge and the Creation of Human Nature* (2007), Roger Smith argues that, "The word 'human' denotes something coming into existence in historical processes" (2007: 7).

By implication Agamben's Socratic imperative carries with it the role of that which urges, whether it is the philosopher or (to pick up on his metaphor) a machine of our making. In the *Apology* Plato says of Socrates' role in Athens that it was "as a gadfly to a horse, which, though large and well bred, is sluggish on account of his size and needs to be aroused by stinging" (*Apol* 30e). Like earlier technological instruments computing brings more of the world into view and multiplies what we can do in the time we have. It stings us awake, however, when it overturns what we think we know, the more so in proportion to the range of human concerns affected, the most when it stings our self-conceptions. And so my question: how can the digital humanities sting as the humanities do when they put the human before us?

The answer I have been arguing for is quite simply that in its critical role the digital humanities can do this by centring on the bicameral cognitive struggle between method (of which computing supplies the most rigorous form we have) and understanding in the humanist tradition, or to switch from Gadamer's terminology to Vickers', between the rule-following machine and the role-playing person, with the sought-after potential of challenging the role. We know that computing is getting ever better, with the goal of its designers to converge on human abilities. We know humanity is metamorphic. The conclusion seems to me obvious given the long history of humankind reconfiguring itself.

What may not be so obvious is how the confrontational human-machine scenario, leading to the development of both, plays out in practice. Perhaps the most obvious source for evidence in the digital humanities comes out of statistical studies, either of

literature *en masse*, as in the work of the Stanford Literary Lab, or of the massive *minutiae* of individual texts and small collections. I will draw the one great example I promised at the beginning from the latter kind, i.e. computational stylistics, in which scholars attempt to identify authorial style, and so resolve cases of disputed authorship, by statistical means. Particularly since the publication of *Computation into Criticism: A Study of Jane Austen's Novels and an Experiment in Method* (1987), the Australian scholar John Burrows, and others following his lead, have patiently built up a persuasive case for inference of authorship from a multitude of weak markers. These scholars have reached the point of being able to produce, in Burrows' recent words, "mounting evidence that work by different authors, work in different genres, work of different eras, work in different national forms of English can all comprise statistically distinguishable groups" (2010: 29). Computational linguists have known for some time that probabilistic approaches to the language of the everyday work quite well in carefully delimited practical settings. But the discovery that literary style is probabilistic is of a very different order. This discovery puts one of the most elusive of qualities by which we value the artefacts of human culture into much closer relationship with the physical world than we had thought possible. "The most decisive event of twentieth century physics", Ian Hacking declares at the beginning of *The Taming of Chance*, "has been the discovery that the world is not deterministic" (1990: 1) – that it is stochastic, and so no longer absolutely distinguishable from the artefacts of human culture. Think on that for what it suggests about what we are.

Much more could be said about the appearance of experimental method into the heartland of scholarly practice via computing (McCarty 2007). The fact that experiment and other "styles of scientific thinking", as Hacking has called them (2002; 2009), can be mapped with good fit onto large areas of practice in the digital humanities is, I think, an indication that more examples as potent as Burrows' computational stylistics to shake up human self-understanding will be forthcoming. Mostly what we have are teasing glimpses of what might happen if only sufficient effort could be focused on them. The crucial matter is not so much a change in what we are doing with our machines, rather a different, far more critical focus on what is happening where it is happening rather than after it has happened. In other words, the practical aim of the attitude I am recommending here is for research projects in the digital humanities to look beyond promised deliverables to surprising psycho-philosophical shake-ups in the moment-by-moment doing of them.

The idea of the shocking, revolutionary techno-scientific encounter I have proposed has obvious connections with Sigmund Freud's well-known proposal of three "great offenses" (*große Kränkungen*) against human self-regard – Copernican cosmology, Darwinian evolution and his own psychoanalysis (Freud 1920a/1917; 1920b/1917; cf McCarty 2012). Less often noticed is Freud's suggestion (implicit in the German *Kränkung*, from *krank*, "ill, sick, diseased") that these dis-easings of the mind can be turned to therapeutic effect. He is in fact solidly in the tradition of scientists who at least from Bacon and Galileo in the 17th Century identified the function of unsettling discoveries which bring cognitive maladies to light as paving the way for corrective treatment. Then such therapeutic intent was aimed in the religious terms in which those scientists thought, at restoration of cognitively diseased man to unclouded

Adamic intelligence (McCarty 2012: 9-11). The religious language has not survived in the scientific literature, but much the same moral imperative can be traced forward into current arguments, especially in the biological and computational sciences. This imperative to moral progress is thus a core feature of the scientific programme, hence by techno-scientific inheritance a feature of the digital humanities.

The crux is in the response. Some scientists argue that we must prepare for a world as devoid of human values as arithmetic or, if we insist on human uniqueness, for relegation more bleak than the Roman poet Ovid's to the periphery of the real. The impulse to fence oneself off absolutely from such a bleak future is understandable. But, as everyone who paid attention then must have known at some level, scientific progress strongly implies that no such fence will stand. If, as so often in the imagery and rhetoric of academic disciplines, we conceive the cosmos of knowledge as delimited by what we can see at the moment, then each moving back of that fence decreases the territory of the un-law-governed, where the humanities (and, as recent work attests, some of the sciences) live. Hence the residue, as it seems to algorithmic sight, that turns out to be, in McGann's wonderful phrase, "the hem of a quantum garment" (2004: 201).

Much remains to be done. My intention is to sketch out a kind of *Bildungsroman*, a story of education in, with and against method, that is the gift of the humanities and sciences come together in computing, returned to the society that supports them, told in order to illumine the relation of the digital humanities to the artefacts whose study it mediates. This has not yet been done; *deo volente* it will be. But note that it *can* be. And that fact of possibility is itself to my mind a sufficient argument to strengthen us for the work to come.

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