An anomalous end-maker conversation: 41, 21, 18, 13 or 8 years computing the humanities

(or, half an hour questioning the COCH/COSH Award for Outstanding Achievement, Computing in the Arts and Humanities, 2005)

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Outstanding achievement is the magnanimous accusation of the moment. Generous beyond all expectation – but mightily demanding, as the words betray. Consider them. With the metaphors dug out and exposed, an *achievement* is literally something brought to a head (*á chief venir, ad caput venire*), finished, terminated. An *outstanding* one "stands or juts out" in one's path, "remains to be dealt with" (OED), won't go away. Some sort of graveyard. The stones read as follows: 41 years ago, a first encounter with computing; 21 years ago, first job computing the humanities; 18, *Humanist*, and so many friends; 13, the research project which opened a window to that smell of food; 8, at last, the liberty to seek it out. But enough of that. In this talk I will sketch out a personally experienced intellectual history that tries to make sense of the past, mine and ours, "by returning it to itself" (Dening, *Readings/Writings*, p. 210), with all its undeveloped possibilities. What matters, I will argue, is the restless, desirous questioning, and the particular question that arises again and again from our work: *how do we know what we know*?

1. The problem [SLIDE]

Many here, I expect, will know the delightful epigrams of Alan Perlis (1922-1990), first president of the Association for Computing Machinery and first Turing Award winner. **[SLIDE]** "Is it possible", he asks in his 74th epigram, "that software is not like anything else, that it is meant to be discarded: that the whole point is to see it as a soap bubble?" The conclusion I have come to, after however many years in and around computing, is certainly YES. The historical development of software from monolithic to component design and the layering characteristic of its architecture, both supported by exponential improvement in hardware, plus the increasing technical sophistication of its communities, all support this answer. Reflecting it, and long overdue, is the upgrading of our own self-conception as digital craftsmen: hardly passive "end-users", rather vigorous "end-makers", children of *homo faber*. We don't want something permanent, we want to play! At least I do.

But the positive answer to Perlis' epigrammatic question, and the power of that answer for us, is already implicit in Alan Turing's original design. Turing, you know, was after a different goal in a different though related field, but as Perlis says in his Turing Award lecture, we remember him not for his mathematical proof but for its byproduct: the universal machine. We have

come to understand that the Turing Machine is not an adequate model for "computing in the wild", but Turing's principle of universality marks a radical and enduring rupture in the history of machine-building. It means, as Michael Mahoney has pointed out, that there is no one basic nature to computing, no one convergent form or application, but as many computings as the human imagination has time and inclination to devise. Furthermore, any one of these computings may develop indefinitely, adding layer upon layer of sophistication.

There is, then, no end in sight – or, rather, nothing to stop us, except imaginative failure, from reaching for the unreachable end in sight. For me nothing depicts this imagined goal better than the astonishing visual metaphor I show here **[SLIDE]**, contrived by two Canadian neuroscientists in the early 1980s to promote their research. But I am getting ahead of myself.

In 1976, as I began my PhD, Northrop Frye was looking backward into the future. In an essay published that year, he moralizes on an important lesson about books that he had learned from the hopelessly outdated monuments of theological learning that had loomed before him in the library of his childhood: "The black bindings were appropriate", he wrote: "the books were coffins of dead knowledge. Their impressiveness as physical objects was grotesquely inconsistent with the speed at which scholarship moves, and it was clear that *books ought to have a very different sort of appearance if they are to symbolize the fact that genuine knowledge is always in a state of flux*." (49f my emphasis) Now, although implementation is theoretically, socially and technically more complex than many are prepared to admit, we can confidently say that, YES, the limitless mutability of computing suits us scholars down to the ground. Thank you, Mr Turing.

But that, even thus qualified, is not the whole story, neither about Turing's invention nor about our profit from it. Indeed – I am convinced and hope to convince you – it is not the most important part. Nor (perhaps more significantly for an occasion like this one) does it explain why *I* got involved, and so why I am here. For the explanation, we must go back to Turing's mathematics and why its consequences got under my skin.

In his remarkable paper of 1936, Turing sets out what in principle a mathematical problem-solving machine can do. His central notion is the idea of "effective computability", or what we now know as the defining quality of an algorithm. We may think of effective computability roughly as what it takes to make something computationally tractable: obedience, we might say, to the twin imperatives of total explicitness and absolute consistency of representation. The problem that caught my attention (at first, and for many

years, only on an intuitive level) was what effective computability might mean for the arts and letters and everything else that does not compute. Allow me, by means of a poem, two paintings, an aphorism and a bit of philosophy, to probe my persistent worry. I will present each to you one by one, teasing at each in turn, then bring them all together to make the point that is my return gift. Then I will recount in wandering fashion, like life itself, how I arrived here. In conclusion I will make some observations about what has been done and what now is to be done. **[SLIDE]**

2. Evidence from the real world

My first offering is Louis MacNeice's "Snow", written the year before Turing published his result: **[SLIDE]**

> The room was suddenly rich and the great bay-window was
> Spawning snow and pink roses against it
> Soundlessly collateral and incompatible:
> World is suddener than we fancy it.
>
> World is crazier and more of it than we think,
> Incorrigibly plural. I peel and portion
> A tangerine and spit the pips and feel
> The drunkenness of things being various.
>
> And the fire flames with a bubbling sound for world
> Is more spiteful and gay than one supposes -
> On the tongue on the eyes on the ears in the palms of one's hands -
> There is more than glass between the snow and the huge roses.

[SLIDE] Suddenly, on a winter's day the transcendence of the world, "collateral and incompatible", "suddener than we fancy", "crazier and more… than we think", "incorrigibly plural" and so forth, comes through the window, thus. These things do happen. But what do they have to do with us – and our machines? Hence my worry.

[SLIDE] The first of two paintings I want you to consider is Pieter Bruegel's *Fall of Icarus*, circa 1558 – especially, as William Carlos Williams said, "the splash quite unnoticed" of Icarus falling into the sea, in the lower right-hand corner **[SLIDE, SLIDE]**. Here, thanks to the artist, we see the "collateral and incompatible" of a world suddener and more various than the sober, practical, oblivious, problem-solving plodders through it suppose.

[SLIDE] The second painting, circa 1500, is the left panel from the *Temptation of St Anthony* by Breugel's master, Hieronimus Bosch. Here we see the exhausted saint, assisted by professional men of God, crossing through a demonic landscape. Except, perhaps, for the figure in red, all (including the saint) are oblivious to the demons above and below, as Bruegel's peasants are to the mythological hero. The man in red *may* be noticing or suspecting something, but again only the artist's view presents the world "crazier and more of it" than these professionals think. Again I ask, what does this have to do with us?

The aphorism I have for you helps us toward an answer. Aby Warburg is supposed to have said it, also Mies van der Rohe: **[SLIDE]** "Der liebe Gott lebt im Detail", "Beloved God" – or, in this case, the Devil – "lives in the details". Thus a moral for the story I am telling: that the bits which escape ordinary constructions of the world (including the constructions of computing) open out into another order of reality altogether. But still, what about us scholars and our machines?

Here Ian Hacking comes to our aid. Speaking about work in the sciences, he argues strongly against the popular notion that "observations… provide the data that test theory, or upon which theory is built" (1983: 167). Actually, he points out, this kind of observation – "observation-as-reporting-what-one-sees" – "plays a relatively minor role". It is not very important. What *is* important, and what links the good experimenter to our poet, painters and aphorist, is *being observant*, being at the ready to see "the instructive quirks or unexpected outcomes" of an experiment or, simply, of being in the world. The crucial sensitivity he points to – the sensitivity of MacNeice, Bruegel, Bosch and Warburg – is to the anomalies, the misfits, the stubborn residue left over after our schemes have done their best.

This is not the usual sort of talk one gets in technical and popular discourse, where the focus is on problem-solving and implementation. In computing and the fields associated with it, for example, such residue typically surfaces in proud declarations of how well a particular system performs. Cognition is typically conceived as problem-solving, problems represented spatially (thus "problem spaces") and solutions judged by how much of the space can be accounted for. To illustrate, let us suppose that Bruegel's *Fall of Icarus* is such a problem space **[SLIDE]**, and let us suppose that we are performing a set of operations on this space to explain it in the ploughman's cosmology. Since Icarus takes up less than 4% of this space (I measured it), we could easily boast of a 96% success rate. So, then, all we have to do is to tidy away the residue **[SLIDE]**, and we're done.

Hence the point to which I come: thanks to Mr Turing's design, we now have the ability to devise, generate and endlessly modify schemes of perfect rigour and precision. With work these schemes can be improved. But for the humanities, what gives them meaning, and us jobs, is their interplay with the transcendence of the world they help us to see – the incorrigibly plural, drunken, various and always more than. Jerome McGann has called such residue of computation "the hem of a quantum garment". I have been reaching out to touch this hem since the early 1980s, when my part of our common story began.

3. Personal computing, 1960s-1980s [SLIDE]

My initial brush with computing occurred much earlier, in the mid 1960s, at the Lawrence Radiation Laboratory in Berkeley, California, where I laboured in the fields of high-energy physics. **[SLIDE]** My first direct contact was with this machine, a then old IBM 704, a computer that filled a large room, required a raised floor for the cables and air ducts, used 6,000 vacuum tubes, a drum memory, tape-drives tall as the average person and had much less power than a 21st-century handheld. I wrote programs in assembler language and Fortran for the bigger and better machines that followed. **[SLIDE, SLIDE]** I took pleasure from the craftsmanship of bit-twiddling.

All this looks quaint now, rather Buck Rogerish, but then it *was* the present and seemed, to most of us, the future. Had I been an imaginative engineer, Bill Wulf tells me, I might have been minded to predict that machines would shrink in size and rocket in power. But what I would not have been able to foresee is their presence among us, doing our work our way. *That* required unpredictable, unaccountable acts of desire – a theme to which I will return. Then, in the mid 1960s, computing was all so very unsatisfying, even threatening, and although I saw or felt the sharp edge of the problem, I was not able to see its intellectual promise. My uneducated imagination was incapable of seeing that the inherent crudity of the machines I used was not, as I thought, my imagination's enemy but a most powerful ally. Years studying Milton, the Bible and Ovid with Norrie Frye had yet to awaken and educate it, and many developments in hardware and software had first to take place.

After the PhD, from Toronto in Milton studies in 1984, I failed to find academic employment. (My first failure was in fact here, with the English Department, as Balachandra Rajan's "replacement".) Thus adrift I had time and, thanks to Ian Lancashire, the opportunity to begin a life-long attempt to make sense of experience with computing, first as an advisor to others, then as my own man. By now the machines looked like this. **[SLIDE]** At that point

Joe Rabin's *Computers and the Humanities*, already close to 20 years in publication, had been demonstrating significant activity in most if not all disciplines across North America and Europe. By the time I opened my professional eyes, the potential of computing for scholarship had become locally visible. But what grabbed me, and got my mind to working, was the discrepancy between this potential and various misconstructions or attempts to turn it aside. There was lots of activity but little theoretical sense being made of it as a whole.

In part the misconstructions within the academy were a matter of hype, in part the result of disciplinary specialists' inability to see how a computing *of* as well as *in* the humanities could be intellectually autonomous, to the greater benefit of us all. Such resistance to humanities computing I have come to characterize by two related strategies: either *dismissal* of any basis for it, on the grounds either of the irrelevance, imprecision or triviality of its problems or of its lack of identifiable turf; or *deferral* of promised final solutions to these problems, for which the sarcastic phrase 'Real Soon Now' has become proverbial. Impatience is hardly a virtue, but in my case it had the virtue of stirring me to probe these strategies for what they might teach us, other than never to underestimate human perversity. As a traditionally trained scholar I already took seriously the grounds for seeking out and holding to the most difficult intellectual problems I could find. But the trickier rhetoric of deferral led me to the root lesson. The central error of these strategies, I concluded, is not the demand for relevance, for which some kind of response is reasonable. Nor is it the demand for patience: meaningful results take time. Rather the error lies in the concealed assumption that solving a problem is the end of the matter that generated it. As someone with an earlier background in programming and the arts and crafts, I was prepared to admit that problem-solving skills are required, for example to debug a program or sharpen a chisel. But both the arts and scholarship had taught me that when knowledge is the goal of work, the purpose of solving problems is to get to harder, worthier ones. Hence the fundamental question to which my experience led me. What precisely does computing itself have to do with rendering knowledge problematic? If it is to serve the humanities as they deserve, it must do that.

4. Teaching and questioning [SLIDE]

In the mid to late 1980s, when impatience began driving me to ask this question, I also started teaching the subject. My students, from across the humanities and social sciences, at Toronto and Princeton, taught me in turn that there was in fact a subject, and that it had to be about *method* – the only scholarly concern all of us shared. So I asked: what is it about computational

method that problematizes? The answer had to be what those two strategies of avoidance, with their focus on solutions, were trying to avoid: precisely the systemic failure of computing reliably to solve problems requiring even a minimal degree of intelligence. So what if, I thought, we were to put aside the distracting promise and embrace rather than try to avoid the self-evident crudity of computing, treating the machine exactly as the scholar finds it – 'a stone adze in the hands of a cabinetmaker', as Vannevar Bush said about automated searching, first in 1945 and again, 'in spite of great progress', in 1965. What if, I thought, we were to ask what we can do, not just within the limits its propensity to failure imposes, but also *with* these limits? **[SLIDE]** "What if", as Jerry McGann has said, "the point were not trying to bridge [the] gap but to feed off and develop it?" (2001: 103) What do the failures tell us? What epistemological value do they have?

My evolving question had thus succeeded in becoming a very simple one with a very simple answer. It amounted merely to this: first to observe that people learn through an iterative trial-and-error process, then to ask what form this process takes for computing. We know that this process governs the mastery of skills such as riding a bicycle or soldering pipe joints. If we look at scholarship as what scholars actually do, we can find trial-and-error in it as well, though without the sense of closure that mastery and performance of a practical skill entail. With intelligence, skill and practice, one gets good at interpreting poetry, but interpreting it is not a job that can be completed in the sense that soldering a pipe-joint can be (one hopes). My questioning had thus brought me to conclude first that computing fits into scholarship as a rigorously disciplined means of implementing trial-and-error, second that its purpose is to help the scholar refine that inevitable mismatch, attested by our poets, painters and philosophers, between a representation and reality (as he or she conceives it), to the point at which the epistemological yield of the representation has been realized.

The nature of this mismatch became clear in my first postdoctoral research project, which applied text-analysis to Ovid's *Metamorphoses,* thanks to a generous grant from SSHRC (may it prosper!). Such analysis, I discovered, exacts two requirements: first, that all textual entities in question be explicitly, algorithmically identifiable; second, that any two which the scholar regards as identical be rendered identically. Nothing, and so everything, is left to the imagination. Satisfying these requirements in software was forbiddingly difficult, as is normally true for such research, so I turned to metalinguistic encoding. This had the advantage not only of practicality but also of heuristic encounter on a case-by-case basis with the unsayable subtlety and stubborn particularity of poetic language. The conflict between the entities of this language and the twin computational requirements of complete explicitness

and absolute consistency then opened up to me the *via negativa* or 'negative way' to knowledge for which I have been arguing ever since. Because of their particularizing focus on those transcendent objects of study, the humanities have always had to deal with what the net does not catch. But now we have a *much* better net with which we may systematically not catch "the drunkenness of things being various" (also known as "reality").

In his astonishing essay, "The Unreasonable Effectiveness of Mathematics", Richard Hamming paraphrases the physicist Sir Arthur Eddington: **[SLIDE]** "Some men went fishing in the sea with a net, and upon examining what they caught they concluded that there was a minimum size to the fish in the sea." (1980: 89) All we need do to avoid that error is to swim in the sea, and see for ourselves, looking for the misfit fish.

Another way of approaching the same point opened up for us all as soon as significant quantities of source material became available in digital form, principally with the Web. The importance of accessing this material is no surprise. What can now be done because of the abundance online – despite its sometimes dubious quality and nature – should not be underestimated, though it often is by those committed to doing better. But the torrent rushing out of computers into the various disciplinary heartlands pulled attention away from the difference between cultural artifacts and the data derived from them – away from the analytic concerns of earlier work, as several people have remarked, to a great stocking of the shelves. Revealing much, it simultaneously obscured the quantum leap from seeing such artifacts to seeing them *as data*, as Morgan Tamplin taught me to say. Hence the distinction I make between the use of a computing system simply to deliver results for analysis elsewhere – what I call a 'knowledge jukebox' – and the heuristic use of computing. You might call this the jukebox-versus-toolbox choice. **[SLIDE]**

There are, I realize, other priorities. I am blessed to be able to focus, however blurrily, on the intellectual nub of computing in and of the humanities, or at least on what I take it to be. This nub remains invariant whatever the job-titles may be, wherever the activity is being practiced, whether it is solitary or collaborative and whatever importance it may be given by those who do it. As someone whose first (and so far only) academic job required 12 years of patient waiting and hard work, I am keenly aware that humanities computing is whatever it is because of the disciplinary and institutional setting in which it arose. I am not here speaking of its intellectual debts, many of which are yet to be acquired, rather of its institutional ones. I do not forget that its daily work is precisely in that context, that it continues to draw institutional breath because of the good it does for the disciplines it collegially serves. My

priorities reflect my belief that within institutions of higher learning the intellectual case is primary, but I try never to forget the constant work that allows it to be made and heard. My gratitude to those who keep the bulldozers from my quiet grove, with its birdsong, is unending.

5. Words to remember & the places to which they lead [SLIDE]

Somewhere in *Readings / Writings,* Greg Dening's curiously powerful meditations on a life as an ethnographic historian, he says that in writing a book what the author should aim for is one sentence, or perhaps two, that the reader will remember and that somehow capture its essence. In a brief talk, such as this, I should perhaps hope for no more than a single word. But I will be ambitious and go for three, and one of them a compound! **[SLIDE]** The first is *anomalous* (the quality we value). The second is *end-maker* (what we centrally are). The third is *conversation* (what we must learn ever so much better to do). Together they make, as you've likely already noticed, the handy noun-phrase from which my revised title is taken. Why end with "conversation"?

Because it is the key, without which we are, as Peter Wegner says about algorithms, deaf, dumb and blind to the world. I referred a moment ago to our intellectual debts, many yet to be acquired. Acquiring them is how we learn to talk. Those of us who have spent time on the ground, helping others with their research, know from experience that disciplines are social systems, or "epistemic cultures" (as Karin Knorr Cetina calls them). We know from experience that to collaborate across the disciplines, as our work often directs us, means crossing what Dening calls "the beaches of the mind" and learning the vocabulary of those who see things differently. **[SLIDE]** We know from ethnographers such as Clifford Geertz that disciplines reveal themselves in their "tropes and imageries of explanation", giving us the beginnings of a philological method for thinking our way into the otherness of these other points of view. We sense that to make humanities computing what it is *in potentia* we, like so many others in upstart disciplines, must poach from older fields, finding what help we can where we can.

My own preliminary efforts of this kind have shown me that the history and philosophy of the sciences and of technology are particularly rich in useful, non-submissive ways of beginning the conversation with those who have gone before and with our disciplinary neighbours. As my colleague and friend Harold Short and I now understand the state of play, it looks something like this **[SLIDE].** There is more here to think about than we have time for now, but as the "relations of research" around the bottom half of the Methodological Commons will suggest, the challenge of understanding,

drawing from and perhaps even conversing with all the related fields is enormous. What an opportunity!

I am persuaded that the only way possible for us to respond to the dilemma of competence into which this situation places us is to refresh the idea of competence as a virtue distributed across the community of practitioners. This is an old ideal. But in an important respect it has had a hard go against the primary technology of expressing knowledge, the codex book, which has tended too much to monumentalizing isolation – to the deadening notion of the definitive study. (Remember Frye's "coffins of dead knowledge".) The design of computing and the history of its development push us thankfully toward interactive, conversational exchange and give us emphatically conversational tools, such as *Humanist*.

I believe very strongly that for scholars, conversation, in its many registers, is all. Unlike "being definitive" or "taking a position" (expressions that make me very sad) conversation puts all at risk, invites response, leaves us open and utterly vulnerable. But it thereby grants us keen sensitivity and agile responsiveness to the supple, shifting, polymorphic world of thought. **[SLIDE]** "It is thus", Marcel Detienne and Jean-Pierre Vernant write in their study of wily intelligence in Greek culture, "that the helmsman pits his cunning against the wind so as to bring the ship safely to harbour despite it. Victory over a shifting reality whose continuous metamorphoses make it almost impossible to grasp can only be won through a greater degree of mobility, an even greater power of transformation." We demand as much of our tools. Let us demand as much of ourselves.

I am enormously honoured by your extraordinary recognition. Only Canadians, with their unblocked view of the rest of the world, would reach across the pond for someone who only passed through this wonderful country on his way elsewhere. True, I did stay 20 years, but not long enough to witness your admirable progress in establishing humanities computing.

This progress reminds me that when, in the mid 1980s, I entered the nascent North American scene, dragging experience from the mid-1960s behind me, conditions for humanities computing, as a professionally autonomous field of academic work, seemed dismal at best. Later they got much worse. I do not think the remarkable progress since then, attested by our presence here together, has happened all by itself, because of some heavenly mandate or historical inevitability. I think people made it happen, despite the obstacles, because of what they were able to imagine, *because of what they desired*. Now, apart from remembering my noun-phrase **[SLIDE]** – or (with reference to Ian Lancashire's great 1989 conference, at which I first met my current

department head) perhaps this image **[SLIDE]** – I ask you to consider what you desire to happen next and to push for it with all your strength, with lives "burning in every moment".

Thank you.