# Beyond the word: modelling literary context

Willard McCarty
Professor of Humanities Computing
King's College London

> "Of course, methodical exposition always comes late. In fact, it marks a decadent period of thought. That is the reason why the great system-makers cannot write their books until age has diminished the fecundity of their thought."
>
> C. S. Peirce, "Lowell Lectures on the History of Science" (1958/1903)

## 1.     Introduction

Moving "beyond the word" toward analysis of context has from the outset preoccupied those who would use computing to study literature. It has preoccupied me for the last many years. I have learned by experience that the tools we have are unfit for the literary scholar's job. But the more important lesson I've learned is that although better tools are possible, *the humanist's perspective on tools problematizes them*. That is ultimately the point of tool-development in humanities computing, just as problematizing our methods and objects of study is ultimately the point of applying the tools we do have. Both problem-making acts are less immediate when the purpose is to report (as in epigraphy) rather than to interpret (as in literary criticism), but in the long run our job is not to solve or fix but to question. Our work in text-analysis amounts to questioning. Its frontier is context.

Graeme Hirst has argued that context is a spurious concept (2000). Given his perspective as a computer scientist, I think he is right. Literally there's nothing there to compute, or to reckon by any other means. The literary critic Jonathan Culler would seem to agree: appeal to context explains nothing, he declares, because context is merely more text (1988: 93f). Ben-Ami Scharfstein, a philosopher, declares that "the problem of context is too difficult for philosophers or anyone else to solve" (1989: 4). Its well-known unboundedness, he points out, leads to extreme relativism and so to paralysis – or, as I experience it, claustrophobia. As if those distinguished nay-sayers were not sufficient, the great majority of writers on the subject weigh in with arguments that go very heavily nowhere, or at least nowhere useful to the student and modeller of poetry.

Since we cannot seem to do without the idea, however, we are left with the nagging question of how the textual environment selects for meaning above and beyond contiguity and syntax. Computing gives us means of purchase on what there is to grab: that we know, and that's where we are. But having grabbed what we can, context remains, residual but vast – indeed, as large as all literature.

Currently I worry the problem by attempting to explain a single literary trope, personification, for occurrences of which one begins by identifying nearby words (see Paxson 1994). Even context in highly restricted sense is not a simple matter, since these words not only affect each other as well as their target noun, they also do so each to a degree for which we have no reliable measure – because their degree of personifying force is a matter of context in the broader and far more troublesome sense. At best their connection to the textual locus in question is inferential. The digitally enabled scholar can, as we all know, tag whatever he or she pleases, but if literary-critical encoding is carried out on a text of any great size, the resultant mass of individual tags is in effect intractable. For interpretative purposes anything in digital form that is not readily manipulable is worse than pointless. It is a waste of everyone's time, the encoder's especially.

The critical style emergent in the strong views I am uttering follows from a remark Northrop Frye made in 1989, that were he to write *Anatomy of Criticism* again, computer modelling would get his attention (1991: 6). In what follows I will draw on my analysis of personification to work in small toward what Frye was suggesting might be done for all literature. I will suggest how we can inch toward a further purchase on context by developing a stable collection of theoretical entities larger than the word – though not quite so comprehensive as literary archetypes. I will hint at a more radical and fundamental move that for want of the right words must remain for now in the shadows.

In 1989 Frye expressed a preference for modelling over the quality of science to which he had appealed 30 years before in the *Anatomy*, because, he said, the former came much closer to what he had in mind. But it's worth thinking about both Frye's reachings toward a better future for criticism. It seems to me that rather than alternatives, they have the potential for intimate relation within the humanities. Here I will only suggest what such a relation might be.

Before turning to my own work, to exemplify how these possibilities might be realized, I propose to review the main kinds of text-analysis and to suggest their origins in prior habits of mind. I want in particular to draw attention to the traditions of enquiry that our tools serve, for better and for worse. I do this in order to explain my successive abandonments of tools and to provide a

means of looking beyond to the problematic of tools.

## 2.     Tools, data models and styles of reasoning

The most straightforward application of computing to the study of language takes place nowadays in corpus linguistics. Its essential concerns are aptly named in the title of John Sinclair's elegant little book, *Corpus, Concordance, Collocation* (1991). One can get a surprising distance by following that path of three steps because language, especially English, cooperates with what commonly available software has been able to do for decades. In J. R. Firth's happy formulation, the underlying principle is that "You shall know a word by the company it keeps!" (1957: 11). Marshalling and enumerating this company, concordance software has already helped us to inch forward by resolving context partially into particular words, their patterns of collation and a theoretical entity called "span", within which collocation is probable. Two things are true about this situation: to paraphrase Jacob Bronowski, we are thus able to push back the boundaries of the law and enlarge its dominion (1978: 58-60); to quote Jerome McGann, what remains beyond the law is "the hem of a quantum garment" (2004: 201).

Literary scholars are less well served by concordance software than linguists because literature adds to the linguists' rather amorphous idea of "running text" a complex host of structural relations within and among individual texts. The analytic purposes of the literary scholar go beyond the ancient legal principle of *noscitur e sociis* which Firth is invoking, and so well beyond the capabilities of concordance software as we now know it. Since the invention of keyword-in-context concordancing in the late 1950s, text-analysis has been powerfully shaped by the visual idea communicated in its layout. Prior to its dominance, literary scholars had been following the lead of biblical scholars, who since the invention of the concordance in the 13th Century had been making tools to assemble concordant passages of the Bible as support for interpretation (McCarty 1993: 51-3). Although the intellectual history of the concordance has yet to be written, it seems likely that the medieval inventors were thinking typologically, according to the Christian exegetical method that derives the meaning of the biblical text by showing, as St Augustine said, that "in the Old [Testament] the New is concealed, and in the New the Old is revealed" (*Quaest. in Hepteuch*. 2.73). Augustine, here summarizing the explicit practice of several New Testament authors, argues for keeping the Hebrew Scriptures in the biblical canon. Those Scriptures independently demonstrate the same structural principle and were likely its origin.

My point is that what concordance software implements is a way of looking at text that runs from modern literary criticism back through centuries of biblical exegesis to the founding texts of European culture. We can hardly think in

any other way about how to read and write literature. KWIC was a great invention, but in a sense it diverted literary and literary-like analysis toward linguistic matters. The older concordances listed occurrences by syntactic units and so directed the user toward reading for textual meaning. KWIC centres attention on the word irrespective of syntax, and so directs users *away from* readerly engagement to the target-word with its collocates and strands them there, as both Stéfan Sinclair and Julia Flanders have separately noted (2003: 180; 2005: 54). Hence the literary scholar is apt to feel that with these nifty KWIC tools one quickly reaches an impasse.

The second major tool of text-analysis is statistics, which goes after subliminal constituents of meaning hidden in patterns of word-usage. William James, writing as a psychologist, has perhaps said it best:

> There is not a conjunction or preposition, and hardly an adverbial phrase, syntactic form, or inflection of voice, in human speech, that does not express some shading or other of relation which we at some moment actually feel to exist between the larger objects of our thought. If we speak objectively, it is the real relations that appear revealed; if we speak subjectively, it is the stream of consciousness that matches each of them by an inward colouring of its own. … We ought to say a feeling of *and*, a feeling of *if*, a feeling of *but*, and a feeling of *by*, quite as readily as we say a feeling of *blue* or a feeling of *cold*." (1981/1890: I.238)

For many years scholars such as John Burrows, David Hoover and others have been demonstrating such subtle patterns. The reach of their analyses is steadily growing. Despite the use of tools unfamiliar to most literary scholars, once again the underlying style of reasoning is not in the least foreign. Aristotle observes in the *Nicomachean Ethics* that some ways of knowing are inherently *stochastic*, that is, they proceed not by prediction from laws but by guesswork, based on what seems from experience most likely. Historian Carlo Ginzburg argues that the humanities are not only like that but owe their basic way of working to the stochastic tradition preserved in Galenic medicine, which in turn may be traced back to the primaeval hunter's ability to find and read clues (1989/1986). Again, we are inflecting a very old way of reasoning.

Statistics is at root anything but foreign. Its promise, to find in the actual words a stochastic basis for our cloudy impressions, is great, and its successes to date impressive. Nevertheless the learning curve is quite steep, and it is not at all clear how problems of the kind many of us worry about can ever be tackled. As a result few labour in this part of the field, and that is greatly to be lamented.

The challenges here are first of all in communication. Scholars from both sides need to flatten the learning curve by bridging literary-critical and statistical

training.[1] Much more attention needs to be paid to the statistical analysis of language that has become  central to computational linguistics in recent years. The major disciplinary and communicative problem blocking collaborative interchange is the poor appreciation, on both sides, of the very different trajectories along which humanities computing and computer science proceed (McCarty 2005: 158-98).

The third major kind of text-analysis is the best known and most widely used: metatextual encoding. It has had great success because it deals with textual structures we can recognize but algorithms cannot, now or perhaps ever. It can generously accommodate the idea that non-textual entity X exists somehow in textual location Y. Once again, this is a technology with a very old basis in human habit and ability: to gain control over the world by categorizing its parts. The power of this style of reasoning was exemplified long before computing, for example in the structuring of libraries, in systems of learning and in numerous ontological schemes. Because categorization is (shall we say?) a cognitive primitive, metatextual encoding is unsurprisingly both powerful and familiar. Research in the humanities fundamentally involves systematic categorization, and so implementing it is a natural for software development. But however big-muscled text-encoding has grown, the encoding movement has not developed tools that allow fast manipulation of tags *en masse* in ways central to interpretation, nor (I am told) do we know how to design such tools – hence the problem I identified earlier. Its genius continues to stick close to document entities that are stable and not much in dispute. As a result it serves primarily a reporting function. It is not particularly suitable to those who leap off into the wilds of heavily interactive interpretation, like me.

The fourth major kind of text-analysis is relational database design, which is also based on categorization but implements categories in terms of their relations and rules governing what may be done with them.[2] It resolves an artifact of study into one or more entities, each of which shares an identical set of discrete attributes. By proper design multiple levels of complexity and multiple perspectives on the artefact can be represented. Strict logical principles apply, but for purposes here the important matter is the tradeoff between the severe constraints these principles impose, and the enormous manipulatory power they confer. Unlike both concordancing and statistical analysis, power is over categories rather than over words. Unlike metatextual encoding, the manipulatory tools are to hand.

---

[1] Among other things, Sir Anthony Kenny's masterful little book, *The Computation of Style* (1982), should be brought back into print.

[2] For the principles of relational database design, see Codd 1970 (the first widely circulated paper by its inventor)and 1980; Date 2003.

The ability to manipulate categories implies the possibility of modelling toward their stability over significant amounts of data. In literary terms this means the possibility of resolving some of the contextual penumbra into a stable collection of theoretical entities. Once we have these, a further possibility is intriguingly suggested by the Canadian philosopher Ian Hacking's subtle argument for the natural sciences: that when one has learned how to manipulate a theoretical entity in order to come up with new ones, that entity has become *real* (Hacking 1983: 23-5, 262-75). How applicable is this argument for the entities with which literary criticism deals? The progressive path seems to me unobjectionable. The question for literature, I would suppose, is "real in what sense?" To be a realist with respect to ink and paper, or pixel and screen, is one thing; to be a realist with respect to a text is quite another, and more so the more that text's context is figured in.

Unfortunately the manipulatory power of relational design comes at a great cost. More so than KWIC concordancing, it strands the user far from the text whose data it organizes. So I must conclude my brief survey of text-analytic tools by returning to the problematic with which I began. The plain truth is, as Manfred Thaller is inclined to say, that the "data model" [3] – more generously, the way of working with computers for which analysis of literary text calls – has not yet been invented.

## 3. Imaginative language

But to what end? What does this analysis seek to do? There are many answers. Let me give you one that makes the most sense for my research, to which I will then proceed.

We frequently lament that text-analysis has had little influence on scholarship. One fault may be attributed to what Jonathan Culler has called "just theory".[4] Years ago Leonard Forster argued that theorizing is one among several ways of fleeing from the challenging givens of literature into the safety of comfortable abstraction – from the *data* in its etymological sense to theorizing increasingly remote from the text. Computing yanks us back to the data, but what then? As the critics of naïve corpus linguistics say, with some

---

[3] According to C. J. Date (2003: 6), E. F. Codd invented the term "data model", to which he assigns three components: structural types, inferencing rules and definitions of what states these structural types may assume (Codd 1980). He is using an idealized, mathematical idiom; I am using his term in a looser, descriptive sense, without worrying about rules we do not yet know how to write or even if they are possible. For humanities computing, the point is heuristic modelling by means of rules that remain provisional.

[4] For an excellent discussion of the relationship between theory and text-analysis see Hoover 2007.

justice, the data are not enough. Language is something more, and literature is more than language.

In discussing the cognitive dynamics of narrative, the psychologist Jerome Bruner points out that in reading as in life we enter a kind of power-saving mode when something becomes familiar (1991: 4). He refers to the Russian Formalists, such as Victor Shklovsky and Roman Jakobson, who have taught us that such language wakes us up from the torpor of familiarity by *ostranenie* or "defamiliarization". Shklovsky argued in 1917 that "as perception becomes habitual, it becomes automatic"; we forget the essence of what we are seeing, "And so life is reckoned as nothing" (1965/1917: 11ff).

In 1917, in Russia, this was revolutionary, but it is at least as old as *Gilgamesh*. "Look there!", the god Utanapishtim the Faraway says to his wife, declaring the hero's failure to pass humankind's ultimate test, "the youth who wanted (eternal) life! Sleep, like a fog, blew over him." (Tablet XI). Poetry is constantly preparing us to face that test, constantly there to wake us up. As Jakobson insisted, it *disautomates* consciousness by marking when attention must be paid to some particular thing, when a new perspective on the world – heaven in a wildflower, if you will – awaits an awakening (Bruner 1983; Jakobson 1987).

But what does *ostranenie* have to do with text-analysis? Let me join up the pieces.

In *Actual Minds, Possible Worlds* Bruner argues that there are two modes of cognitive functioning, each irreducible to the other, "each providing distinctive ways of ordering experience, of constructing reality": logic on the one hand, narrative on the other (1986: 11-43). We encounter these cognitive modes in the opposed activities of computing and reading, which together constitute text-analysis. As Bruner goes on to argue, each of these modes also has its ways and means of awakening, each its form of imagining something not yet seen. Thus when Henri Poincaré speaks of the mathematical imagination, by which the mathematician suddenly apprehends "unsuspected relations between… facts, long since known, but wrongly believed to be unrelated to each other" (1996/1914: 51; cf. Bruner 1979/1962: 17-30), what matters is the equation to which the individual facts uniquely point – to the singular abstract truth that beautifully subsumes them. In contrast, when a poetic text marks a moment of awakening, it multiplies reality by revealing alternatives in the concrete and individual moment. As Bruner says elsewhere, "the object of understanding human events is to sense the alternativeness of human possibility" (Bruner 1986: 53). But, more importantly for us, *each of Bruner's cognitive modes uses the other as its foil in the awakening it brings about*. Not only is there no understanding the one without

the other, but when, as in text-analysis, the two come together, it is in the playing off of the one against the other that the intellectual power of the tool lies. By this argument, from the literary-critical perspective, the analytical point of computing is to arrive at enduring formalisms – to arrive at triviality and dullness, if you will – as quickly and efficiently as possible.

## 4.    Ovid's defamiliarization

Let be now turn to my own research to illustrate. Like all good literary critics, I begin with a text.

This is the *Metamorphoses* of the Roman poet Publius Ovidius Naso, whom we call Ovid. It comprises almost 12,000 lines of Latin hexameter in 15 books, written in Augustan Rome around the turn of the era. It describes the mytho-history of the world from creation to the apotheosis of Julius Caesar, in a notoriously loose structure somewhat like that of the Bible. Within this mytho-history it includes, refers and alludes to a vast, open network of stories interconnected in highly complex ways. To combine the imagery of Roland Barthes and of Jorge Luis Borges, this network "with a thousand entrances", and a thousand thousand paths within it, exhibits its author's declared intention: *in novo… mutatas dicere formas / corpora…*, "…to talk about forms changed into new bodies". But as we quickly discover, the past participial *mutatas* ("changed") of Ovid's mytho-history turns into the reader's present participial experience of relentless changing. Furthermore, there are strong reasons to think that the *Metamorphoses* is not just a poetic object but – here is a crucial point to which I will return – that it is also an agent of self-propagation, affecting subsequent literature not so much as a work to imitate but rather, like life itself, as an open-ended, self-replicating process. Although the *Metamorphoses* nearly vanished from view for almost two centuries, within the last half century it has resurfaced to become once again a powerful and influential mirror of our changing natures, as Marina Warner (among others) has shown. We are once again Ovidian.

I have been working on the *Metamorphoses* with software since the mid to late 1980s. The first phase of this work used text-encoding to record *all* linguistic devices referring in any way to persons and places, with the idea that manipulating these would provide a way of commanding the largest body of evidence for the poem's elusive structure. The result was a hypertextual work comprising about 60,000 tags and software for generating its interlinked Web-pages. I abandoned it once I realised that encoding on such a scale had, for reasons I have given, inevitably led to an effectively unchangeable *and therefore unfit* instrument for studying Ovid's perpetually shifting world. Hence my strong opinions on the matter.

With manipulation in mind I moved from encoding to the only other possibility among currently available techniques, i.e. relational database design. For a time the highly effective tools for textual categorization, and especially for rapid manipulation of categories, seemed to me fair compensation for having to navigate between relational tables and literary text, for being stranded very far from the text. That time has now passed, but allow me to dwell in it for a while so that I can explain what it yielded. Certainly one yield was the realization that we need a different data-model for literary-critical work.

Having decided that the whole of the *Metamorphoses* is currently too much to handle, I narrowed my scope to roughly 500 instances of personification in the poem, where the poet, functioning metaphorically like Orpheus, turns a normally subhuman entity into a human or human-like being. Personification is a fit subject for research in humanities computing because it is both sufficiently tractable as data and elusive enough to hold out promise of great intellectual reward. It's about as hard a problem to handle as we may progress.

Usually the term "personification" is applied to poetic characters, especially abstractions such as envy, jealousy or lust, that not only appear in the text but also engage with other characters. They are not simply noticeable but are as a rule emphatic, stagey presences who affect the narrative directly. The first work in European literature to employ them prominently was the *Psychomachia*, or "soul-battle", of Aurelius Prudentius Clemens, in the late 4th or early 5th Century. This poem depicts the Christian virtues and vices in bloody battle for the soul of man, employing personification to teach doctrine. Like the *Metamorphoses* it was hugely influential.

Unlike the *Metamorphoses,* however, it is anything but subtle. The emphatic nature of the personification character suits Prudentius' didactic aim perfectly. Ovid's very different aim – to destabilize our widely shared assumption of what is – requires stealth beneath the surface as well as action above it. Ovid uses personification characters, such as *Inuidia* (Envy) or *Fortuna* (Luck), from time to time, but the dominant form of personification in the *Metamorphoses* is of another sort. This is the "personification figure", which is short-lived, hardly noticeable, numerous and often merely anthropo*centric* rather than anthropo*morphic*. It is created quietly, by attributing one or more ontologically unusual qualities to a sub-human entity. This quiet disturbance moves it closer to the human state. If, for example, a poet writes "the wind sighs", a personification figure comes into being – in this case, with no bodyparts, no speech, no cognition – just a sigh.

Actually that is not quite right, but to see why requires some additional background.

Thanks to a crucial observation made by the medievalist Morton Bloomfield in 1963, we can now talk about personification as made in language by the action of contextual words and other factors on each other, and we can see that this can happen at such a minute scale as to be momentary, barely there at all. Thus our plotless utterance, "the wind *sighs*", suggests that something is up by attributing a human action to a non-human thing, and then whatever it was is gone, having done its work on the reader's mind. But to draw out the fact and implications of such brief utterances, to do this in a cogent, defensible way, conjures up a bewilderingly complex set of problems. The critic must be able to demonstrate, for example, that however much personifying force one attributes to "the wind sighs", one must do the same wherever in the poem that verb is coupled with that kind of thing. One must have reasons to hand for each critical judgement. Should this poetic wind be discovered to have additional personifying attributes (such as a voice or emotion), these must also be taken into account with the same rigour of consistency. Perhaps the resultant complexity of accounting is why, in a time when computing was not easy to summon, nothing much came of Bloomfield's suggestion. Now that computing is to hand, we can develop it.

One of the implications of construing personification as something made in language by the total effect of discrete entities is that it cannot possibly be a binary phenomenon. What is suggested, rather, is its refraction into an ontological spectrum that ranges from the abstract and the inert to the fully human. The question is not whether something is a personification figure, rather the degree to which it is.

Consider what could be done with codex technology. Early medieval manuscripts of the *Psychomachia*, for example, brilliantly demonstrate how personification characters could be brought compellingly alive by giving them visual form. But personification figures are another matter. Denoting them explicitly had to wait for capitalization to develop, many centuries after the *Metamorphoses* was written. The problem is, however, that capitalization is crudely binary. I suspect that we tend to think of personification as binary, and so to lose sight of the subliminal instances, precisely because of a typographic convention. Computing offers us other forms of representation (such as graphics) that can be used to return us to the analogue indeterminateness of Ovid's text.

So far I have viewed the personification figure in isolation and may seem to have implied that the various philosophical, historical, linguistic and literary contexts in which any poetic text is embedded can be ignored. But it will

likely be obvious that we cannot ignore these contexts, even if we cannot say what context is. Whether a personification, to the degree that it is one, figures in any given interpretation of its context is not a given but is to be determined by interpretation. Let us say that in a particular language, for a particular kind of reading, we judge the attribution of sighing to the wind to be a bog-standard feature of language – metaphorical to be sure, but dormant. If so, then there is an argument for attenuating its effect within the poem. But this argument must face challenges – at minimum from whatever poetic theory one adopts, the assumptions made about the audience one chooses to consider and how one interprets the poet's intention. Again, consider codex technology. Even if it were practical to do the work that the personification figure requires, we would still have to decide what to print, and so which theoretical perspective to fix. As you know, computing offers us the possibility of setting parameters, and so representing any theoretical perspective we can describe computationally. But that is only the beginning.

## 5.      Modelling in theory

Undergirding the contrast I have been making between the codex book and computing is an argument I have made elsewhere at length (2005: 20-72): that the central function of computing for scholarly analysis is not building digital replicas of books, or what I call "knowledge jukeboxes", but *modelling*. This is what Frye pointed us almost 20 years ago.

I use the gerund emphatically rather than the noun *model* to distinguish process from product: on the one hand, the progressive cycle of constructing, manipulating and reconstructing a digital representation; on the other, any given state of that representation. It is clear from Mr. Turing's scheme (however inadequate it may now be) not only that there are many computings but also that each one of them is in a crucial sense only a temporary expression of whatever human purpose motivated its design. The more sophisticated, the more cultural this purpose, the more temporary. Because the cultural artefacts at which we direct computing are transcendent, there can be no final, exhaustive models of them.

Nothing new here – except the speed at which the modellings happen, the volume of data on which they operate and the rigour imposed by digital representation. Because we are mortal, time is crucial – more profoundly than we tend to realize. We think differently when more comes more quickly into view. And because of the rigour imposed by digital representation, and the transcendence of cultural expressions, a gap separates, and will always separate, modelling from the modelled. To paraphrase Jerome McGann again, the main point for us humanists is not to try closing that gap but to feed off and develop it (2001: 103). For us it is a cornucopia.

## 6.      Modelling in practice

My attempt to model personification with relational database software
followed these steps:

1. First I classified each named entity of interest according kind (all birds
   of whatever variety as birds &c), then according to a relatively simple
   ontological scheme. The details of this scheme are unimportant. What
   matters is to have some way of expressing ordinary expectations, e.g.
   that a rock is normally visible, inanimate and unmoving but that wind
   is invisible, inanimate and always moving. In other words, because we
   say an entity is personified when some behaviour or quality unusual
   for its kind is attributed to it, we must know what usual means.
   Unfamiliarity requires familiarity.

2. I analyzed each locus of personification according to identifiable agents
   within the context, that is, all grammatically related words; nearby
   attributes of the named entity; and any relevant features of the broader
   context, whether these are expressed explicitly or not.

3. I assigned to every personifying agent a set of numerical weights
   according to my ontological scheme. These weights were automatically
   applied with absolute consistency to every combination of a given
   agent to an entity of a given kind. For example, the verb "sigh" would
   carry the identical weight for all visible entities that are in motion but
   not animate. Assignment is at first by educated guesswork.

4. I ran a set of database queries that summed the weights for each
   personification and exported the totals to spreadsheet software. From
   these a chart was generated. I compared each personification
   represented on the chart to my reading of the poem. If the original
   guesswork was wrong, the error tended to show up as inconsistent or
   anomalous behaviours where the given agent occurs. I adjusted
   weights and fixed faults as needed. Thus I approached something like
   objectivity by achieving consistency.

5. Unsurprisingly this didn't always work. Where the problem was
   intractable, I marked it by adding a location-specific fudge-factor to
   remove the anomaly. Later I would examine the troublesome instances,
   taking them to be clues to heretofore undiscovered features of the
   poem – overlooked words or, more significantly, emergent but
   unnamed features of context.  Several revisions of the database
   structure followed, successfully addressing many of these instances. A

number of theoretical entities began to emerge. More about these in a moment.

## 7.      Surviving problems and emergent results

I mentioned a moment ago how annoying misfits, denoted by provisional fudge-factors, have served as clues to unforeseen causes of personification. Other interesting problems have arisen simply because I have been forced by the rigour of implementation to confront them. One example is the oddly persistent effect of some attributes, such as fatherhood, which violate the general rule that personification figures vanish as quickly as their discrete causes. (Once a father always a father? Or does the existence of progeny guarantee a personification?) Another is the role of quoted speech: if an unreliable character, such as Narcissus, attributes personifying force to an entity, do we value it the same, and if not, by how much is it affected? A related problem is narrative intercalation, or the occurrence of stories within stories: how is our reading of personification in a story affected by the stories within which it is embedded, and how is that effect altered by the sequence of reading?

Another, more complex and challenging problem, which brings the whole model into question, is the simplifying but highly dubious assumption that individual agents do not affect each other but act in isolation on the named entity – a problem I alluded to earlier. Here the old and enigmatic notion of context is useful, for it not only names the unresolved penumbra of meaning, and so allows us to talk about that penumbra, but it also gives us a way of talking about the totality of personification's semantic network. We might say that it is a placeholder for a complete catalogue – except we should know that not only will such a catalogue never be achieved but, more importantly, that seriously to desire one is an intellectual death-wish. To complete such a catalogue would require that the poem ceased to be read and that human creative responses to it ceased.

Work with the database model demonstrated to me at least that the theoretical entities I mentioned earlier are emergent from the modelling. One class of them that became clear consists of stereotypical human situations, such as battle, meeting in council or athletic competition.[5] Another class comprises mythological kinds, such as creation or magical presence, most

---

[5] The first is found, for example, when in the fight that erupts during the marriage of Perseus and Andromeda, *manum fortuna iuuat*, "fortune helps [Perseus'] hand" (5.140); the second when Neptune summons his rivers (1.276); the third when Hippomenes wonders, in the contest with Atlanta, *cur certaminis huius / intemptata mihi fortuna reliquitur?*, "why in this contest fortune remains untried for me?" (10.584f).

notably of Medea and Orpheus, in whose presence things come alive. Another class describes structural congruence between stories, one of which involves an established anthropomorph, the other an incipient personification. In each case these "hang in the air", but at varying distance, with varying degree of explicit tie to the place where they are evoked. But what hangs above them is the question of their reality – to which, again, I will return.

## 8.     Reasoning by analogy and where it leads

So far I have discussed a familiar kind of intellectual operation, in which we subject a phenomenon to analysis with the aid of a tool, generate questions and put them to our conception of the text, literature, the discipline, our colleagues and so forth. I have just suggested that by modelling for a better match with an informed reading, certain theoretical entities emerge and that with further work these might solidify. I have pointed to the possibility that if they do, we might be able to use them in aid of further work. Now, however, I want to venture out into the first of my rather more adventurous regions.

Elsewhere I have argued that modelling of the sort I have described, involving quantification of readerly responses to a text, leads to analogies from the poorly understood phenomenon in question to better understood physical systems and their mathematical tools (2005: 53-71). I have, for example, made use of the physiological analogy to perception, which on the face of it seems close and which provides a way of modelling readerly saturation by the multiple stimuli typical in instances of personification. (Thus each contributing factor has progressively less of an effect as the factors accumulate. Readerly response is quickly attenuated by the power-saving mode for which the Russian Formalists argued.) The analogical style of reasoning is utterly commonplace. But what is not commonly mentioned is its basis in the assumption that the world which contains both the well- and the poorly understood systems is *isotropic*, i.e. that all things in this world behave according to the same basic principles or laws, even if we do not understand how. From this assumption, we then reason that if we want to understand something unknown, we take something that behaves in a similar way, something that we do understand, and then use knowledge of it to probe the unknown system. We assume that similar behaviour is basic rather than adventitious – that we live in a cosmos, not a chaos.

In the present case, leaving aside for a moment the implications of an isotropic connection between reading and seeing, two questions arise. The obvious one is, what can neuro-physiological perception tell us about detecting personification when we interact with a readerly text? The less obvious question is the reverse: what can reading personification tell us about the neuro-physiology of perception? In other words, we land immediately *in*

*medias res*, in a hermeneutic circle, with the highly appealing prospect that the far more demanding problem (personification) will through the analogical connection make strenuous demands of somewhat less demanding one (perception).

It seems not so only if you assume that the physiology of vision is a closed book, and that the book in question, written by a positivist, depicts real physical things, out there, objective and reliable, which somehow become mental stuff, in here, subjective and unreliable. Very few people would now admit to such a depiction, though we are frighteningly prone to think in its terms. The best current research, such as Semir Zeki's, avoids it, indeed opens up exciting ideas of how we create reality in interaction with the physical world (1993; 2006). Nevertheless, the positivist's depiction can easily be smuggled back into mind by the underlying assumptions of a strictly close, data-centred reading. Here we have philology, not theory, as a flight from literature.

In other words, the analogical bridge I suggest we build goes both ways. We look back and forth, for a theory of vision adequate to what is read, and a theory of reading adequate to how we see. Lurking behind is the implication that the connection being traversed is not simply analogical but genetic.

## 9. Which science?

The question of the mediating role that computing may play in bridging the sciences and the humanities is clearly relevant, but since I have proposed a model for that bridging elsewhere (2007), I will leave it aside here. Rather I assume that by assimilating computing into the humanities, we are particularly apt to think and work in broadly scientific ways. It is difficult to see how we could escape the cumulative influence of scientific thinking in any case, so the better course is to make that influence conscious and examine it critically. This is not so difficult thanks to historians and philosophers of science, especially since the 1960s, when (to quote Ian Hacking echoing Nietzsche) Thomas Kuhn and others unwrapped the dehistoricized "mummy of science… and saw the remnants of an historical process of becoming and discovering" (1983: 1).

In consequence the enormous diversity of scientific practice is no longer so well hidden by the assumption that, in essence, science is physics. So, in making the influence of scientific thinking conscious, we have not so much to choose from which science(s) to learn as to see that different sciences involve us in different discourses about the world. Each conducts its work "within an agreed-upon set of conventions about what counts as a relevant contribution,

what counts as answering a question, what counts as having a good argument for that answer or a good criticism of it" (Rorty 1980: 320).

In my research this question was raised when I realised that operationalizing context can go in two directions, either by defining specific instances or by describing how contextualization happens – by cataloguing products and computing their results or by modelling a process. My database model began with the notion that one could gain insights into the *Metamorphoses* by defining the contexts for individual personifications, however provisionally, computing the effect of each on its target noun, making adjustments and repeating the cycle. Methodological insights did emerge, as I have attempted to indicate. But several sharp challenges to and disagreements over the poetic results led to the inescapable conclusion that having in effect defined "context" *as a discrete thing in and of one or more known texts*, I had rendered the notion too arbitrary to be of any use. I could not come up with an authority or a rationale for deciding what to include, what to exclude, and when including something, how to determine its effect on the whole.

Literary studies had already taught me to regard the *Metamorphoses* not so much as a delimited work to be anatomized and analyzed but, as I said at the beginning, as something like a self-propagating mechanism. The link between this literary-critical view of the poem and the beginnings of an adequate theory of context came (as it happens) via the theoretical biologist Robert Rosen's admonition in *Essays on Life Itself* against "a mind-set of reductionism, of looking only downward toward subsystems, and never upward and outward" (2000: 2). Rosen's argument orbits the theoretical physicist Erwin Schrödinger's turn toward a "new physics" in *What is Life?* (1946). The theory of context toward which I am working is indebted to Humbert Maturana's and Francisco Varella's theory of *autopoiesis* (1980/1972) or principle of self-organization, which Terry Winograd and Fernando Flores used in their important argument for the design of computing systems (1987). It looks to intriguing work in biological anthropology, for example Terrence Deacon's "Emergence: The Hole at the Wheel's Hub" (2006); to work in anthropological linguistics, where the dynamic formation of understanding in conversation is examined, for example by Alessandro Duranti (1997); and to studies in musical improvisation, such as by David Sudnow (1978, 2001) and Paul Berliner (1994). For literary studies the perpetually fructifying work of Mikhail Bakhtin is fundamental. As Lyn Hejinian notes in her insightful essay, "The Rejection of Closure" (2000), Umberto Eco's argument for the co-creativity of reader and writer is very helpful (1984/1979). Jerome McGann's view of textuality as algorithmic characteristically overstates the case in order to make the point toward which this theory of context is moving (2001: 138).

My somewhat breathless though much abbreviated reading list is a sign of how incunabular the project is. Its (very) long-term and perhaps utterly unrealistic objective is to generate possible literary futures for the personifications of the *Metamorphoses*, then to compare them to the future these tropes actually had, or rather, the future that we have known to describe so far by the haphazard course of our literary knowledge. The current stage of this project is the formation of a "language of inquiry", as Hejinian says. All suggestions and comments are welcome.

**Works cited**

[All URLs last accessed 23 September 2007.]

Berliner, Paul F. 1994. *Thinking in Jazz: The Infinite Art of Improvisation*. Chicago Studies in Ethnomusicology. Chicago: University of Chicago Press.

Bloomfield, Morton W. 1963. "A Grammatical Approach to Personification Allegory". *Modern Philology* 60.3: 161-71.

Bronowski, Jacob. 1978. *The Origins of Knowledge and Imagination*. Mrs Hepsa Ely Silliman Memorial Lectures. New Haven CN: Yale University Press.

Bruner, Jerome. 1979/1962. *On Knowing: Essays for the Left Hand*. Cambridge MA: Belknap Press.

-----. 1983. [untitled]. In *A Tribute to Roman Jakobson*. 88-92. Berlin: Mouton Publishers.

-----. 1986. *Actual Minds, Possible Worlds*. Cambridge MA: Harvard University Press.

-----. 1991. "The Narrative Construction of Reality". *Critical Inquiry* 18.1: 1-21.

Codd, E. F. 1970. "A Relational Model of Data for Large Shared Data Banks". *Communications of the ACM* 13.6: 377-87.

-----. 1980. "Data Models in Database Management". *ACM SIGMOD Record*. Proceedings of the 1980 workshop on Data abstraction, databases and conceptual modeling. 11.2 (June).

Culler, Jonathan. 1988. *Framing the Sign: Criticism and its Institutions*. Oxford: Basil Blackwell.

Date, C. J. 2003. "Edgar F. Codd, August 23rd, 1923 – April 18th, 2003, a tribute and personal memoir". *SIGMOD Record* 32.4 (December): 4-13.

Deacon, Terrence W. "Emergence: The Hole at the Wheel's Hub". In *The Re-Emergence of Emergence: The Emergentist Hypothesis from Science to Religion*. Ed. Philip Clayton and Paul Davies. 111-50. Oxford: Oxford University Press.

Duranti, Alessandro. 1997. *Linguistic Anthropology*. Cambridge: Cambridge University Press.

Eco, Umberto. 1984/1979. *The Role of the Reader: Explorations in the Semiotics of Texts*. Bloomington: Indiana University Press.

Firth, J. R. 1957. "A Synopsis of Linguistic Theory, 1930-1955". In *Studies in Linguistic Analysis*. Special Volume of the Philological Society. Oxford: Basil Blackwell.

Flanders, Julia. 2005. "Detailism, Digital Texts, and the Problem of Pedantry". *Text Technology* 14.2. texttechnology.mcmaster.ca/pdf/vol14_2/flanders14-2.pdf.

Forster, Leonard. 1978. "Literary Studies as a Flight from Literature?" *Modern Language Review* 73: xxi-xxiv.

Frye, Northrop. 1991/1989. "Literary and Mechanical Models". In *Research in Humanities Computing 1. Selected papers from the 1989 ACH-ALLC Conference*. Ed. Ian Lancashire. 3-12. Oxford: Clarendon Press.

Ginzburg, Carlo. 1989/1986. "Clues: Roots of an Evidential Paradigm". In *Clues, Myths, and the Historical Method*. 96-125. Trans. John and Anne Tedeschi. Baltimore: Johns Hopkins University Press.

Hacking, Ian. 1983. *Representing and intervening: Introductory topics in the philosophy of natural science*. Cambridge: Cambridge University Press.

Hejinian, Lyn. 2000. "The Rejection of Closure". In *The Language of Inquiry*. Berkeley: University of California Press.

Hirst, Graeme. 2000. "Context as a Spurious Concept". *Proceedings, Conference on Intelligent Text Processing and Computational Linguistics*, Mexico City, February: 273-287.

Hoover, David. 2007. "The End of the Irrelevant Text: Electronic Texts, Linguistics, and Literary Theory". *Digital Humanities Quarterly* 1.2 (Summer), www.digitalhumanities.org/dhq/vol/001/2/000012.html.

Jakobson, Roman. 1987. "Linguistics and Poetics". In *Language in Literature.* Ed. Krystyna Pomorska and Stephen Rudy. 62-94. Cambridge MA: Belknap Press.

James, William. 1981/1890. *Principles of Psychology*. Cambridge MA: Harvard University Press.

Kenny, Anthony. 1982. *The Computation of Style: An Introduction to Statistics for Students of Literature and Humanities*. Oxford: Pergamon Press.

Maturana, Humbert R. and Francisco J. Varella. 1980/1972. *Autopoieses and Cognition: The Realization of the Living*. Dordrecht: D. Reidel.

McCarty, Willard. 1993. "Handmade, Computer-Assisted, and Electronic Concordances of Chaucer". In *Computer-Based Chaucer Studies*, vol. 3. Ed. Ian Lancashire. 49-65. Toronto: Centre for Computing in the Humanities. staff.cch.kcl.ac.uk/~wmccarty/essays/.

-----. 2005. *Humanities Computing*. Basingstoke: Palgrave.

-----. 2007 (forthcoming). "Being Reborn: The Humanities, Computing and Styles of Scientific Reasoning". In *New Technology in Medieval and Renaissance Studies* 1: 1-23.

McGann, Jerome. 2001. *Radiant Textuality: Literature after the World Wide Web*. New York: Palgrave.

----. 2004. "Marking Texts of Many Dimensions". In *A Companion to Digital Humanities.* Ed. Susan Schreibman, Ray Siemens, and John Unsworth. 198-217. Oxford: Blackwell Publishing. www.digitalhumanities.org/companion/.

Paxson, James J. 1994. *The Poetics of Personification*. Literature, Culture, Theory 6. Cambridge: Cambridge University Press

Peirce, C. S. 1958/1903. "Lowell Lectures on the History of Science". In *Values in a Universe of Chance: Selected Writings of Charles S. Peirce (1839-1914)*. Ed. Philip P. Wiener. New York: Doubleday.

Poincaré, Henri. 1952/1905. "On the Nature of Mathematical Reasoning". In *Science and Hypothesis.* Trans. W. J. G. New York: Dover Publications.

Rosen, Robert. 2000. *Essays on Life Itself*. Complexity in Ecological Systems Series. New York: Columbia University Press.

Scharfstein, Ben-Ami. 1989. *The Dilemma of Context*. New York: New York University Press.

Shklovsky, Victor. 1965/1917. "Art as Technique". In *Russian Formalist Criticism: Four Essays*. Trans. Lee T. Lemon and Marion J. Reis. 3-24. Lincoln NB: University of Nebraska Press.

Shrödinger. Erwin. 1946. *What is Life?* London: Macmillan.

Sinclair, John. 1991. *Corpus Concordance Collocation*. Describing English Language. Oxford: Oxford University Press.

Sinclair, Stéfan. 2003. "Computer-Assisted Reading". *Literary and Linguistic Computing* 18.2: 175-84.

Sudnow, David. 1978. *Ways of the Hand: The Organization of Improvised Conduct*. Cambridge: Harvard University Press.

-----. 2001. *Ways of the Hand: A Rewritten Account*. Cambridge MA: MIT Press.

Warner, Marina. 2002. *Fantastic Metamorphoses, Other Worlds*. Oxford: Oxford University Press.

Winograd, Terry and Fernando Flores. 1987. *Understanding Computers and Cognition: A New Foundation for Design*. Boston: Addison-Wesley.

Zeki, Semir. 1993. *A Vision of the Brain*. Oxford: Blackwell.

-----. 2006. "The Neurology of Ambiguity". In *Artful Mind: Cognitive Science and the Riddle of Human Creativity*. Ed. Mark Turner. Oxford: Oxford University Press.