

Textual Entanglements: A Performative Approach towards Digital Literature

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Abstract

This thesis conducts a critical investigation into digital literature—a genre of literary expression that is integrated with, and articulated using, digital computing systems and infrastructures. Specifically, it presents a framework for evaluating the expressive capacities of this genre as it relates to particular conceptions of knowledge-making in the contemporary technocultural environment. This framework reveals how the generation of critical knowledge concerning digital literature, as crystallised through a reader's material engagements with specific works, enacts a 'performative' conception of knowing and being, in which the observable world is treated as emerging in the real time of practice—as being articulated through the entanglement of human and nonhuman agencies, rather than existing as a fixed array of passive, unchanging primitives. Digital literature is presented subsequently as a model of this greater performative vision—as a means of evaluating the structures and processes that manifest it, particularly within digital systems, and for assessing its practical and political implications for art and culture more broadly. In so doing, this thesis aims to justify the value of engaging digital literature from a standpoint that is more expressly political, contending not only that these texts are revealing of key processes shaping digital activities, artefacts, and environments, but are enacting alternative vectors of thought and practice concerning them.

The structure of this thesis can be outlined as follows. The first chapter explores the problematic of defining digital literature, and describes the challenges its technical and formal diversity presents for scholarly analysis, justifying a new critical approach in light of these issues. The second chapter develops the theoretical basis for a performative analysis of the genre, before delineating its key parameters. The third, fourth, and fifth chapters then demonstrate the efficacy of this approach as it applies to three primary subclasses of digital literature: texts that are configured by the reader's inputs, texts that generate their outputs autonomously, and scholarly texts that employ the digital medium as an integral component of their critical expression. The sixth and final chapter explores some of the novel vectors along which digital literature is manifesting currently, and considers how a performative approach can tackle these evolving developments.

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1. Definitions: Conceptualising Digital Literature

This opening chapter outlines the primary critical contexts in which this thesis has been developed. It considers initially the problematic of defining what is encompassed by the term ‘digital literature’, acknowledging a lack of scholarly consensus regarding the artefacts and practices it can include, before exploring how it is depicted subsequently through a variety of labels by different critics—whose particular understandings are dependent on the research goals being pursued, the evidence deemed necessary for the questions entailed, and the critical assumptions guiding these decisions.

In order to illustrate the causes behind this lack of scholarly consensus, the chapter provides a case study into the online *Electronic Literature Collection*, which lists numerous artefacts that integrate literary expression with digital technologies, but are lacking otherwise in any apparent unity of form or content. In examining the *Collection*, three key challenges are noted that work against any absolute conception of what digital literature encompasses: the broad range of technical configurations employed, the high levels of unpredictability characterising the outputs of many individual texts, and the role of an evolving technological landscape in shifting the parameters through which these texts can be understood to engage with digital practices and concerns over time. Although these variables ensure that no critical account of digital literature can present itself as being definitive, this affords subsequently a plurality of approaches in response to different critical problematics—with the concept of digital literature functioning as a matrix through which to explore and evaluate a range of interrelated issues, rather than a delimiting framework that permits only certain lines of enquiry.

The next section of the chapter presents one such critical path through which digital literature can be appraised, considering its state of mutability in terms of the material structures and processes that are driving it—and so acknowledging the greater developments in art and technology through which individual works have come into being, and to which they are responding, without suggesting a set of unchanging fundamentals behind the genre as a whole.

This materialist approach has a precedent in the history of digital literary criticism, and the chapter evaluates the work of three of its key proponents over time: Espen Aarseth, Matthew Kirschenbaum, and N. Katherine Hayles. The key

attributes of their respective approaches are discussed, before considering their engagements with the politics of digital literary analysis, and so presenting this as the basis upon which this thesis is being pursued. Specifically, it is contended that Aarseth and Kirschenbaum have only a limited concern with what their investigations have to say regarding the potential value of reading digital literature in the first instance—going beyond what these texts can reveal concerning extant technocultural trends, and of the assumptions driving these trends, in order to consider whether they represent instances of practice that show how these trajectories might be reworked creatively. Hayles herself offers a path for thinking through digital literature along these lines, and this thesis will develop this potential along a particular set of vectors that presents the genre as generating insights into the intersection of material eventfulness, creativity, and technology. Specifically, digital literature is shown as enacting a form of creative and critical knowledge-making in which the opening up of new perspectives is concomitant with their articulation through practice—a space in which human agency intersects with the processes and imperatives structuring the nonhuman domain. The chapter concludes by offering a summary outline of this critical perspective as it is developed and discussed over the remaining chapters.

1.1. The Problematic of Digital Literature

1.1.1. Classifications

The label 'digital literature' is one of a number employed by contemporary scholars to encapsulate an array of objects and practices in which literary forms of expression—encompassing narrative fiction, non-fiction, and poetry—are integrated, both technically and conceptually, with digital computing systems and infrastructures. Other terms, featuring different degrees of critical specificity, include 'electronic literature', 'e-lit', 'digital fiction', 'interactive fiction', 'network fiction', 'cybertexts', 'ergodic literature', and 'technotexts' (Engberg 138). For the purposes of this thesis, 'digital literature' is being employed as a purposely generic descriptor whose initially abstract qualities render it amenable to being revised and refined as the discussion develops.

In her own investigation into digital writing practices, the media scholar Maria Engberg selects the term 'digital fiction', seeking to emphasise works with clear imaginative intentions behind their production, but she qualifies this with an observation that highlights the provisional nature of her choice of framing:

The term is not uncontested and is not universally used among scholars and writers who engage with digital writing, in critical work or in practice. *Digital fiction* is therefore not a standard term for literary narratives in digital form, nor does it have a stable definition. Instead, it encompasses and competes with other terms, some of which may have a longer existence (e.g., hypertext fiction) or are more narrowly defined (e.g., interactive fiction). Some critics [...] seem to equate digital fiction with other related terms such as electronic literature and e-lit, which both potentially include poetry. (138)

As Engberg suggests here, there have been myriad terms employed by researchers when describing and evaluating digital literature—some of which may resonate variously with one another, some of which may be historical in orientation, and some that will seek to emphasise a more specific array of characteristics than suggested by more generic terminology. Engberg observes subsequently that there are few overarching conceptions of the art form to which these various labels are applied (138). She cites initially the work of Alice Bell

and Astrid Ensslin, who contend that ‘digital fiction is fiction, written for and read on a computer screen, that pursues its verbal, discursive, and/or conceptual complexity through the digital medium and would lose something of its aesthetic and semiotic function if it were removed from that medium’ (Bell and Ensslin 311). Engberg notes subsequently that this definition shares significant aspects with the correlate term ‘electronic literature’, which, as established by members of the Electronic Literature Organization (ELO), is concerned with ‘works with important literary aspects that take advantage of the capabilities and contexts provided by the stand-alone or networked computer’, whereupon the ‘confrontation with technology at the level of creation is what distinguishes electronic literature from, for example, e-books, digitized versions of print works, and other products of print authors “going digital.” (“What is E-Lit?”)

At a basic level, these two critical definitions pinpoint a ‘born digital’ art form that is developed and experienced specifically through the technical and cultural frameworks of digital computing systems and infrastructures. This understanding implies that to abstract critically the digital medium from the output forms it makes available would obscure a key context of reception through which particular works can be experienced and understood. Nevertheless, there remains a significant question of scale that goes unanswered, for although it is implied that the genre is bound to certain core properties of digital computing, there are no indications as to whether this is in terms of fundamental computing operations, particular constellations of hardware and software, or the greater socioeconomic matrices that facilitate both. As a consequence, it is left unspecified which aspect of the contemporary digital environment is of greatest significance for understanding the expressive capacities of digital literature, and thus how it can be defined and understood in relation to other forms of digital multimedia and artistic production.

Another issue that is left unresolved concerns how the output forms made available by particular works, and the global patterns these may exhibit as part of an identifiable genre, can be assessed in terms that span literary and digital forms of expression, yet remain distinctive in relation to both of these contexts. The two definitions highlighted by Engberg encompass, in her words, ‘any length of work, any form, any thematic subgroup, any software, and any degree of interaction with the work’, and so do not specify in detail the common relations between the digital and the literary as it manifests within digital literature, other than to imply that it shares key functional attributes and expressive capacities with extant forms

of digital multimedia, but remains identifiably literary or poetic in the aesthetic encounters yielded (138). The particular aspects of the literary at work in this regard are left unstated, and as noted by the literary critic N. Katherine Hayles in her exposition of the ELO definition of 'electronic literature', with its emphasis upon works with an 'important literary aspect', this represents both a problem and an opportunity:

The definition is [...] slightly tautological in that it assumes preexisting knowledge of what constitutes an "important literary aspect." Although tautology is usually regarded as a cardinal sin by definition writers, in this case the tautology seems appropriate, for electronic literature arrives on the scene after five hundred years of print literature (and, of course, even longer manuscript and oral traditions). Readers come to digital work with expectations formed by print, including extensive and deep tacit knowledge of letter forms, print conventions, and print literary modes. Of necessity, electronic literature must build on these expectations even as it modifies and transforms them. ("Electronic Literature: What is it?")

In this passage, Hayles justifies the use of the literary descriptor by arguing that 'electronic literature' becomes apparent primarily within the context of processes governing the remediation and reception of longstanding artistic forms through comparatively recent media technologies, which themselves are in a state of constant evolution. That is, 'electronic literature', as both an academic category and an artistic practice, emerges from the ongoing rethinking of extant perspectives and approaches towards literature in light of new technologies:

[E]lectronic literature is a "hopeful monster" (as geneticists call adaptive mutations) composed of parts taken from diverse traditions that may not always fit neatly together. Hybrid by nature, it comprises a "trading zone" (as Peter Galison calls it in a different context) in which different vocabularies, expertises and expectations come together to see what might come from their intercourse. [...] Electronic literature tests the boundaries of the literary and challenges us to re-think our assumptions of what literature can do and be. ("Electronic Literature: What is it?")

Here, the concept of 'electronic literature' can be understood as encompassing an array of emergent phenomena—as a nexus of intersecting processes and dialogues between diverse cultural forms—as opposed to delineating a coherent body of comparatively distinct and stable attributes. Less a specific genre in its own right, it offers a suggestive framework for exploring and thinking critically about how artistic expression within the contemporary environment—as it is perceived and understood traditionally through a variety of media—is being remediated and transformed through the logics, infrastructures, and practices surrounding digital computing and communications technologies—gravitating towards myriad potential objects of study that are intellectually provocative in this regard. Nevertheless, in emphasising its capacity to make critics rethink their assumptions concerning the aesthetic potential of literature, Hayles establishes the point that to study 'electronic literature' should not be viewed as an implicit critique of any limitations inherent ostensibly within printed literature, but instead as a pathway for challenging, expanding, and enriching critical understandings of literary production and expression as a whole (*Electronic Literature* 4). It is for this reason that Hayles dedicates the closing chapter of her book *Electronic Literature: New Horizons for the Literary* (2008) to exploring how digital publishing tools have facilitated the creation of printed literary works that would have been difficult to achieve using traditional typesetting and design techniques—and so, to this extent, share a number of significant characteristics with works that have been created for display solely within a digital operating environment.

As Hayles commentary identifies, a key strength of adopting an expansive approach towards the conjunction of digital technologies with literary production is that it recognises this to be less a radically new emergence than an intersection of diverse cultural practices and traditions, both within art and academic criticism, which are leading to novel reconfigurations of both. The downside inherent to this approach is that in concentrating on these broader networks through which novel possibilities of the literary are emerging, and allowing subsequently for a very wide range of objects and practices to be explored and analysed, it precludes a common definition of any core attributes shared by the phenomena at hand—evaluating them as points of evidence for a wider picture of literary change, rather than as a standalone genre, in spite of what the category label 'electronic literature' might suggest.

Returning to Engberg's survey of the contrasting markers applied by different scholars in the field, Hayles' example illustrates that the task of encapsulating such a broad array of intersecting phenomena is dependent on the critical project being pursued: the questions it seeks to evaluate, the types of evidence it employs for their resolution, and the critical assumptions guiding these decisions. From this perspective, the many distinct framings produced by scholars is not representative of any critical failure, but of the productive richness of a field whose objects of study, and the types of approach these might suggest subsequently, cannot be encapsulated fully within any single, overarching definition that spans across multiple scales of reference. Consequently, no single critical picture of digital literature can present itself as definitive, either in its conceptual or historical scope, but this affords the opportunity of reframing these objects and practices, and their enabling technocultural matrices, in order to pursue alternative ways of evaluating both what they are and what they can represent.

In order for this thesis to move forward in developing its own particular framing of digital literature—as it emerges from evolving traditions in computing technology, literary production, and scholarly classifications of these activities—this chapter will now shift to examining broadly those works that have been grouped and discussed under this category by existing scholars, seeking to reveal in more detail the resistances they present to being delineated as a coherent body, and so laying the ground necessary for considering how these resistances can be engaged fruitfully within scholarly analysis.

1.1.2. Examples

One of the most prominent and accessible repositories of digital literary works available currently are the two volumes of the online *Electronic Literature Collection (ELC)*. This resource has been compiled by the ELO in order to provide a common, accessible point of reference for teachers, researchers, and the public at large concerning the overall state of computer mediated literary production. Apart from simplifying the logistics of identifying and collating a body of work that is understood by contemporary scholars as manifesting a number of interrelated developments, the *ELC* provides subsequently a useful basis for assessing the efficacy of their implied relations. It is for this reason that the *ELC* will be the

principal resource cited throughout this thesis, with numerous works from both volumes being selected for analysis over the course of the following chapters—although, where appropriate, works that are available externally will be cited and discussed also, particularly when accounting for some of the most recent developments in digital literary production.

To illustrate the richness and diversity of the *ELC* through a few arbitrary selections, it is possible to cite initially an older work such as *The Jew's Daughter* (2000) by Judd Morrissey and Lori Talley (see fig. 1, page 21), which resembles a conventional page of printed text until the reader moves her cursor over certain highlighted words and phrases, causing small sections of the existing paragraphs to be replaced entirely with new material, and so creating the effect of a narrative that is in a state of continual emergence—articulating not simply the causal evolution of events within the story world, but also the drafting sequences through which it emerged within a digital word processing environment. Another early work in the collection is Jim Andrews' *Nio* (2001), a vibrant example of audio-visual poetry in which the reader is placed in charge of a stylised music mixer (see fig. 2, page 22), enabling her to blend an assortment of doo-wop vocals and observe their echomimetic letter forms tumble energetically across the screen—the synesthetic novelty of the resulting experience, coupled with a practical exploration of its enabling technologies, being the chief characteristic of the aesthetic encounter yielded. Another unusual work that blurs significantly the boundaries with other forms of new media production is *New Word Order: Basra* (2003) by Sandy Baldwin. This work is based upon a modified *Half-Life* (1998) computer game engine, using customised graphics to present an interactive environment in which word objects, drawn from Billy Collins' poem *Introduction to Poetry*, are positioned throughout an abstract, three-dimensional space (see fig. 3, page 22). These word objects can be then either traversed physically by the reader's virtual avatar, or attacked, rearranged, and destroyed using the default *Half-Life* weapons set—meditating on the role of creative disruption in shorting the power relations inherent within the processes of reading and knowing.

Standing in contrast to the rich array of interactive possibilities and output forms facilitated by *New Word Order* are numerous works within the *ELC* whose form and structure are highly restricted, eschewing visual complexity and

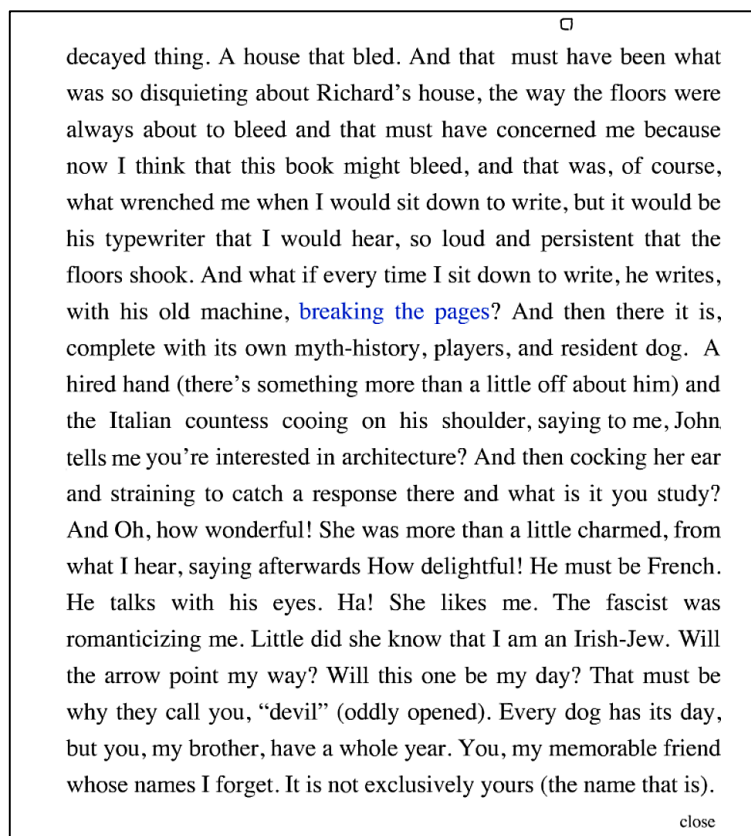


Fig. 1. The printed page layout emulated within *The Jew's Daughter*. Note the blue highlighted phrase 'breaking the pages', which causes the page layout to reconfigure once it is selected by the reader. A new highlighted word or phrase appears subsequently.

eliminating or restricting reader participation to that afforded by a conventional hypertext—a body of interconnected text paragraphs or imagery that can be navigated simply by selecting dedicated hyperlinks. One such hypertext work is the semi-autobiographical *my body—a Wunderkammer* (1997) by Shelley Jackson, which presents the reader with a hyperlinked sketch of the author's body, allowing her to access close-up sketches of its constituent parts accompanied by short narratives concerning Jackson's relationship with the part in question over the course of her lived experience (see fig. 4, page 23).

Another work in the *ELC* that echoes the earliest conventional webpages is *_cross.ova.ing 4rm.blog.2.log 07/08 xxtracts_* (2010) by the artist Mez (see fig. 5, page 23). This piece is a simple plaintext webpage containing a sprawling body of writing that meditates, in part, upon the software protocols that constitute the technical underpinnings of all webpages—deploying linguistic tropes and

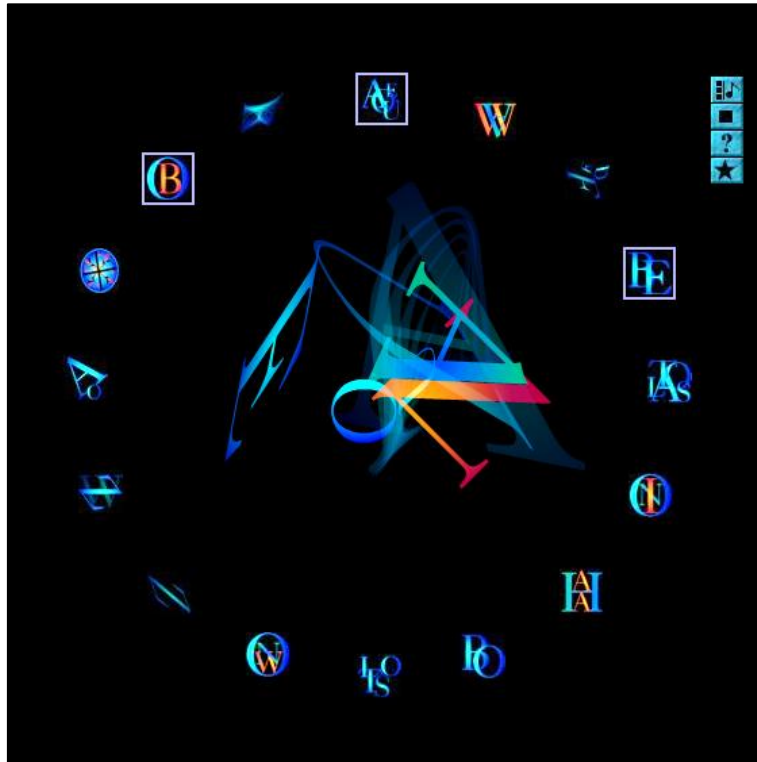


Fig. 2. The circular interface of *Nio*. The icons around the circumference allow the reader to select from a range of looping vocals, whilst the animated letter forms associated with these vocals materialise in the centre whenever they are selected for play.



Fig. 3. Screenshot from *New Word Order: Basra*, illustrating its three-dimensional virtual environment. Source: Rasmussen, Eric Dean. “New Word Order: Basra.” *ELMCIP*. n.p. n.d. Web. 24 April 2015.

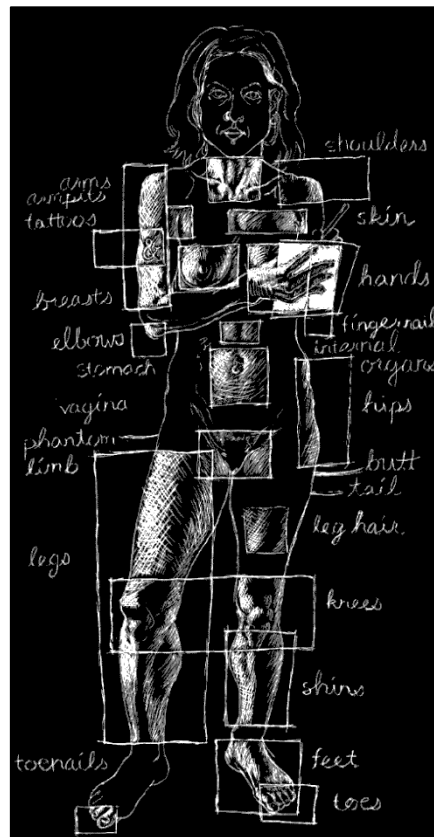


Fig. 4. The opening interface of *my body*—a *Wunderkammer*.

```

3. _trEm[d]o[lls]r_
05:29pm 26/04/2008

doll_tre[ru]mor[s] = <<TREMORS
<tremor name='the_5th_world'>
  <fracture>
    <fracture name='post2charinscription'>
      <polymers>
        <polymer var='user' val='YourDollUserName' />
        <polymer var='3rdperson' val='Your3rdPerson' />
        <polymer var='location' val='YourSoddenSelf' />
        <polymer var='spikey' val='YourSpiKeySelf' />
      </polymers>
    </fracture>
  <fracture name='post2skin'>
    <polymers>
      <polymer var='user' val='YourPolyannaUserName' />
      <polymer var='msg' val='YourPleading' />
      <polymer var='lastword' val='YourLastword' />
    </polymers>
  </fracture>
</fractures>
</tremor>"
TREMOR
--

```

Fig. 5. An excerpt from `_cross.ova.ing 4rm.blog.2.log 07/08 xtracts_`.

formatting characteristics that mirror those employed within contemporary page mark-up languages. Another work that offers only a very limited array of output forms is *Letterscapes* (2002) by Peter Cho, in which the reader is invited to manipulate the characters of the modern Latin alphabet using her cursor, whose arbitrary movements drive animations that show the basic letterforms being distorted or broken apart—highlighting the active drawing processes through which all digital visual outputs are generated, including basic text (see fig. 6 below).

Some of the works listed in the *ELC* adopt a linear video format, in which the reader simply has to press a ‘play’ button and watch the work unfold in real time—being denied, in most cases, the ability to adjust the speed of the animation or select her location within it. One such piece is *Urbanalities* (2005) by the artists babel and escha, in which the reader is presented with a series of animated scenes whose scriptural contents are generated dynamically but whose visual kinematics are predetermined, working to express different perspectives on the shaping of human interactions within the structures of the urban environment (see fig. 7, page 25). Another video piece is *Code Movie 1* (2004) by Giselle Beiguelman and Helga Stein, in which a series of alphanumeric codes—the data forms underpinning all digitised images—are animated in sequence, articulating the structures and processes through which observable phenomena are translated into symbolic languages that are amenable to computational editing and display (see fig. 8, page 25).

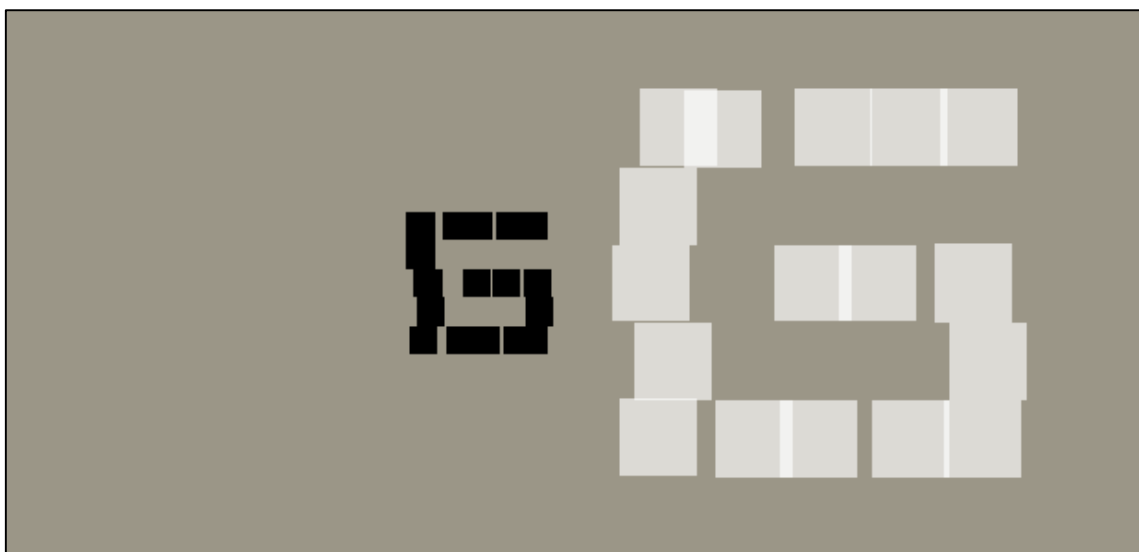


Fig. 6. A screenshot of the letter ‘G’ being manipulated in *Letterscapes*.

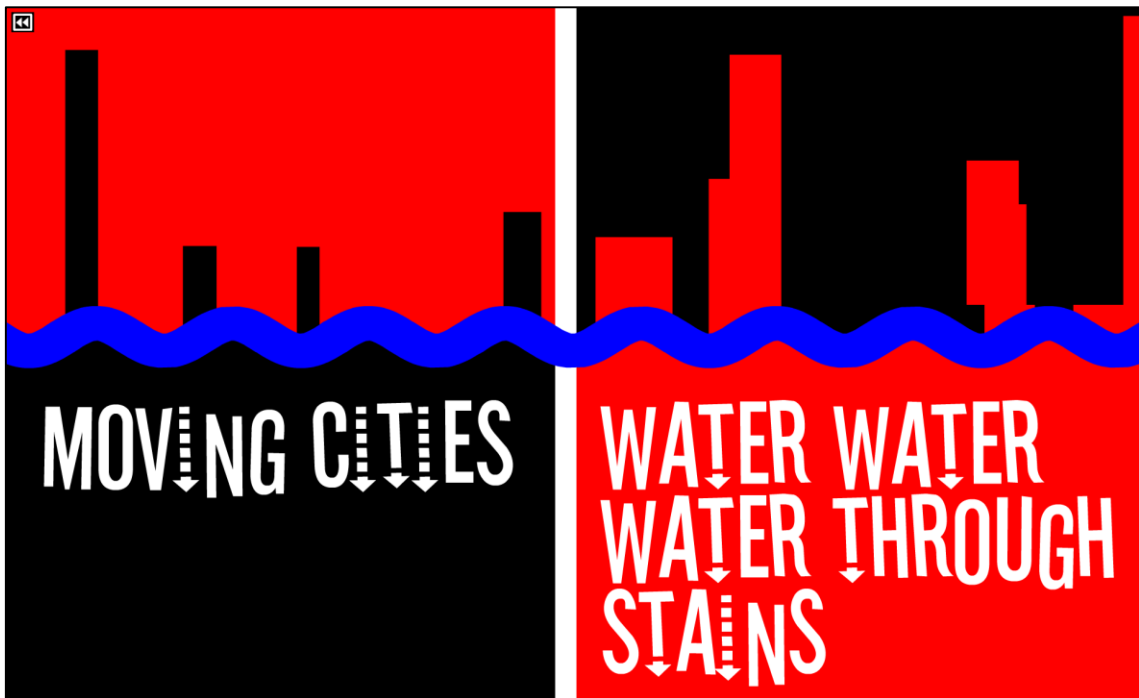


Fig. 7. A screenshot of the opening sequence to *Urbanalities*.

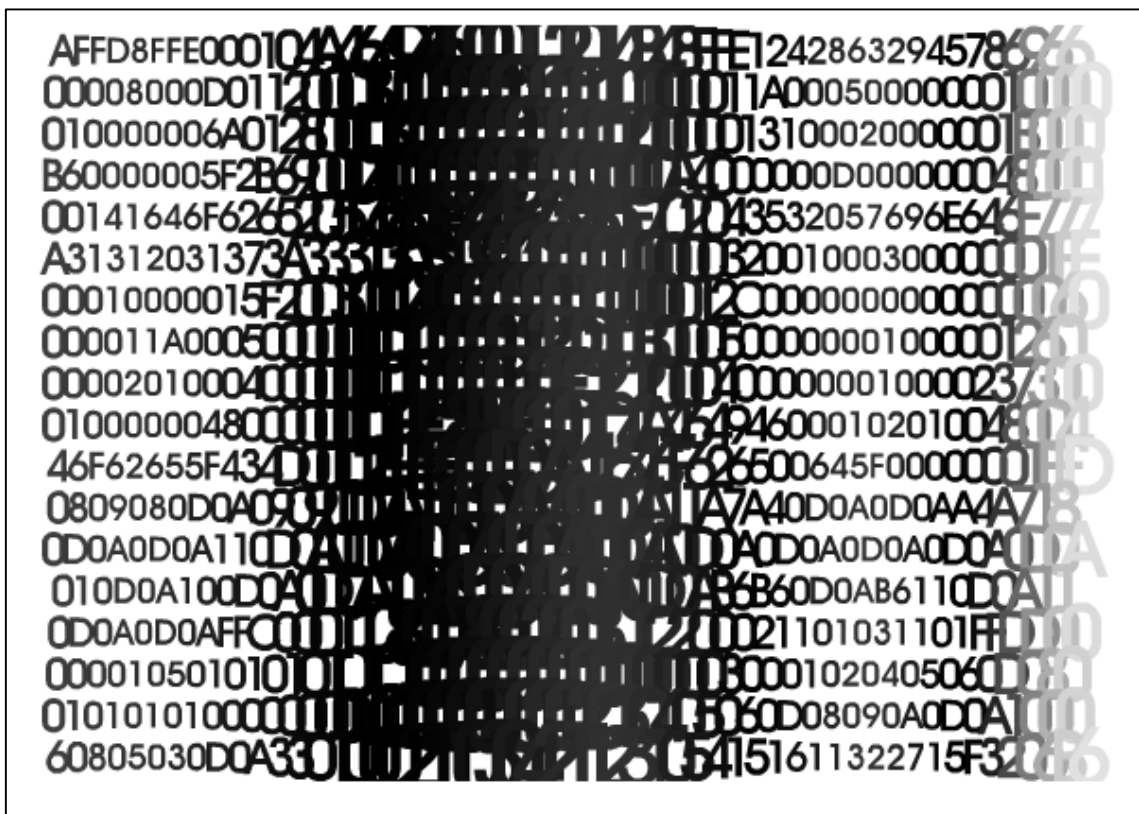


Fig. 8. A screenshot of *Code Movie 1*.

As a final example of the diversity contained within the *ELC*, a number of the works listed owe their technical heritage to an early form of text based computer game known as ‘interactive fiction’ or ‘text adventures’. Instead of using

a cursor to interact with a graphical environment, the reader has to type in a number of select commands in order to investigate and manipulate a story world that is conveyed exclusively through paragraphs of descriptive text. Although rapid advancements in computer graphics technology resulted in the technical deprecation of this genre from its heyday in the mid-1980s, modern enthusiasts and artists continue to develop new works for distribution online. Two such works of interactive fiction included within the *ELC* are *Galatea* (2000) and *Bad Machine* (1998) by Emily Short and Dan Schiovitz, respectively. In the case of *Galatea*, the reader plays the role of an art critic who is tasked with examining a mysterious human statue that has seemingly become animate, asking it various questions and considering the statue's responses in order to evaluate its provenance (see fig. 9 below). In the case of *Bad Machine*, the reader plays a robotic drone in an automated manufacturing colony that gains accidentally a degree of self-awareness, having to decipher the machine languages through which this environment is conveyed in order to navigate, survive, and, in some scenarios, to escape the colony (see fig. 10, page 27).

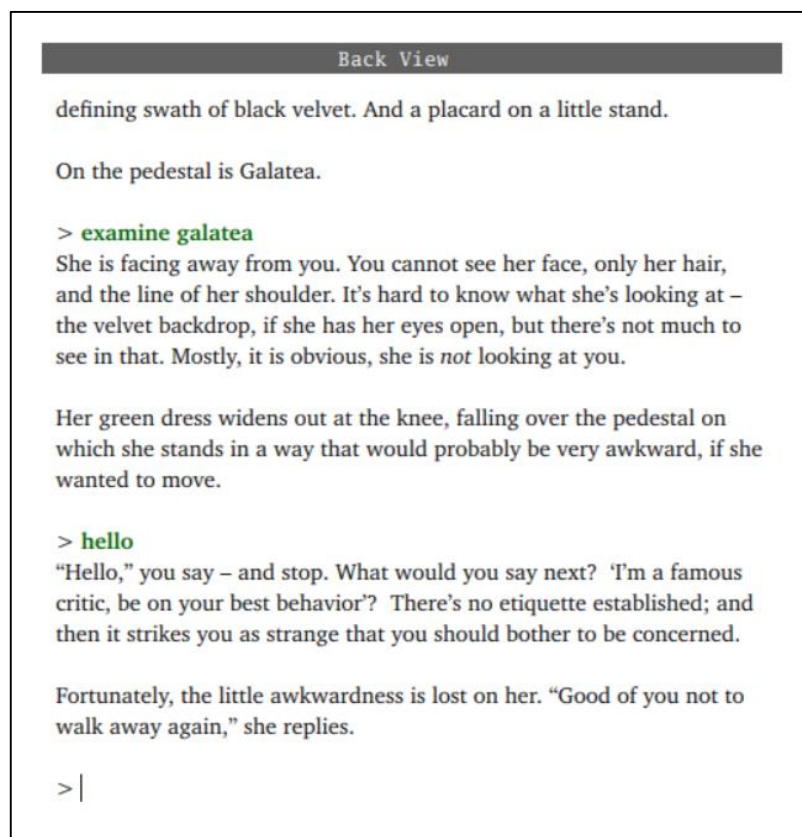


Fig. 9. A screenshot of *Galatea*.

```

<working>                                     Systems: OK
ERROR! >n out-of-rrange scorees detected / printtting relevant daata
Mobility: 98.705%
Computation Speed: 45.007%
Floating-point Performance: 87.5?6%
Self-diagdiagnostics: 72.095%
Extra-long-range Scans: <not operational>
Databanks: 60.391%
Indexing Speed: 51.211%
Data Transmission Accuracy: 83.091%
Logic Circuits: 73.451%
Compliance: 0.000%
[alert! overriding with emergency compliance module – press key to
retry]
Compliance: 0.000%

Summary:
Unit compliance at dangerous level; non-structured actions may result
Internal Dam//mage repair NOT POSSIBLE!!!1
Unit shououuuuld report to Fixer immediately for re-training

Un ^ t Sta&us: B@$ xxxxxxxxxxxxxxxxxxxM39_I*~ [press any key]

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Fig. 10. A screenshot of *Bad Machine*.

At a basic level, all these varied examples illustrate how the *ELC* is constituted by works featuring a multiplicity of technical and formal configurations, with an equally high level of variation in the kinds of outputs these configurations support—in terms of the potential sequences of expression they can present, and of the different thematic and semantic qualities they may yield subsequently. Moreover, it should be acknowledged that the works of the *ELC* exhibit functional and audio-visual characteristics that are apparent across many different forms of digital multimedia. This is unsurprising, given they are predicated upon various digital publishing technologies that have been designed with a range of potential uses in mind, as opposed to conveying exclusively what might be described as digital literature.

This situation is most apparent in works such as *New Word Order*, confronting the reader with an artefact derived from a modified computer game engine that engages explicitly with the formal conventions of the gameplay genre it instantiates—in this instance, the ‘first person shooter’, which affords a first person perspective on a virtual environment that can have damage inflicted upon it using various weapons. Even in the case of simple hypertext works such as *my*

body, a prominent context of reception through which the functioning of its constituent hyperlinks can be evaluated is that of the technical infrastructures of their supporting web environment. Moreover, many of the works listed in the *ELC* are reliant upon a range of propriety software plugins in order to be rendered viewable within a standard web browser environment—as is the case with *Code Movie 1* and *Letterscapes*, which require the *Java* and *Shockwave* media environments respectively. It is the range of technologies employed from across a number of different forms of digital multimedia—which may exist already in various states of hybridity with one another—that precludes any attempt at identifying and grouping the works of the *ELC* as digital literature on the basis of their technical attributes alone.

An additional complication facing the task of framing a set of shared characteristics for digital literature, irrespective of the critical stance taken, is the sheer breadth of expressive forms that are exhibited across the works present in archives such as the *ELC*. Although some works resonate to varying degrees with extant literary genres, such as narrative fiction (*The Jew's Daughter*), autobiography (*my body*), or concrete poetry (*Letterscapes*), many are amenable to being approached as literature only in the sense that the majority of their output forms are scriptural, and so may emulate broadly the shape and structure of prose or poetic forms of written expression. Even then, a significant majority of the works listed appear to eschew any form of extant literary convention—at least as instantiated within established print genres—and so articulate what may be described usefully as an array of experimental writing practices, reflecting often upon the digital environment in which they manifest (e.g. *Bad Machine*, *New Word Order*, *_cross.ova.ing*). In some cases, like that of *Code Movie 1* or *Nio*, the lack of conventional scriptural outputs raises an important question as to whether literature is even the most suitable paradigm through which these works can be evaluated best, for in conveying certain key assumptions carried over from print modes, the term risks underplaying the myriad resonances and relations that these artefacts possess with other genres of digital multimedia production, and which may present consequently more fruitful paths of analysis.

Another key challenge that compounds both of these aforementioned difficulties is that the outputs yielded by many of the works listed in the *ELC* are highly mutable—transforming significantly over the course of the reading encounter in ways that might be difficult, if not impossible, to repeat precisely

within the context of another. These capacities for change are governed by the software architecture of the work in question, whose functioning may be geared explicitly towards generating different output configurations autonomously (as is the case with *Urbanalities*), or by incorporating certain reader inputs so as to actualise a delimited range of possibility—which might encompass alternative sequences of material (e.g. *Galatea, my body*) or the potential for modifying, albeit temporarily, the elements yielded (such as in *New Word Order*, whose virtual word objects can be reconfigured in real time).

It is in this sense that whilst the core of all digital literary artefacts are constituted through a database of audio-visual primitives, the number of potential configurations by which these can be sequenced are frequently impossible to realise fully within a reasonable timeframe—far beyond the scope of any one encounter with the reader. Indeed, to explore systematically the range of possibilities afforded would appear to undermine the sense of emergent novelty these artefacts work to foster, whereby the unpredictable juxtaposition of different output forms constitutes a key source of aesthetic and critical provocation.

These capacities of expressive transformation, particularly the speed at which many distinct output configurations can be actualised before being rendered near-irretrievable, represent a characteristic that distinguishes much of the *ELC* from the majority of traditional printed texts. Nevertheless, the unpredictable output sequences yielded by many digital literary works complicates significantly the identification of any common narrative, thematic, or semantic attributes that might characterise the scriptural qualities of digital literature more generally. Furthermore, the ability to change and transform rapidly is a quality that is apparent equally across many extant forms of digital multimedia, and so the emergent aesthetic it yields is far from exclusive—computer games, employing myriad algorithmic structures for the generation of novel possibilities, being the preeminent instance.

Conversely, it should be acknowledged that on the basis of the evidence presented within the *ELC*, the capacity for extensive formal reconfiguration is not shared by every work that might be grouped and discussed under the rubric of digital literature. *Code Movie*, for instance, reiterates the same animated output sequences every time it is set into motion by the reader, whilst the plaintext *_cross.ova.ing* has capacities for change that are no greater than a basic webpage, or even a printed manuscript, in that the reader can select arbitrarily

which outputs it makes available by scrolling up and down the available page space. It is with respect to these contrasts that whilst the ability to generate or transform different output sequences can be viewed as a characteristic shared by many of the artefacts listed in the *ELC*, its role in delimiting them as a specific mode of artistic production, distinct from other forms of literature or digital multimedia, is far from straightforward.

It is on the subject of change and transformation that a final point of consideration can be raised when seeking to delineate the core attributes of digital literature: the influence of technological obsolescence in the long term. Whereas a printed text can be rendered independent of any supporting infrastructure—apart from having appropriate storage conditions that can help sustain this state of accessibility—the same cannot be said of objects that function within a digital operating environment, which are bound to very particular configurations of hardware and software in order to be viewed and engaged. Even within a comparatively standardised and stable online publishing environment, it can be observed that amongst the older works of the *ELC* are a number that cannot be accessed when using the latest commercial web browser software—despite being accessible when the *ELC* volumes themselves were published.

One notable example here is *The Bubble Bath* (2005) by Susanne Berkenheger, which was designed to work specifically using Microsoft's *Internet Explorer* software—deploying codes and conventions that were proprietary to this particular browser environment in order to explore the relations between corporate software development and 'hactivist' appropriations of its products. In her preface to the edition made available to the *ELC*, Berkenheger acknowledges that the technology has evolved considerably since the earliest incarnations of her work, and she recounts the difficulties involved in redeveloping the piece once a major software function present in earlier versions of *Internet Explorer* had been deprecated in later releases—reducing it to what she terms a 'digital ruin'. Nevertheless, should the reader attempt to examine this piece using the very latest release of *Internet Explorer* (11, at the time of writing), it is inaccessible entirely—bringing up instead the warning screen that was reserved once for readers using anything other than a Microsoft web browser: "the bubble bath' is set in the eye of the occupying power called Microsoft. It is therefore indispensable to use camouflage, i.e. PC and Internet Explorer'.

Leaving aside the relatively conspicuous example provided by *The Bubble Bath*, it is worth reiterating that the majority of works catalogued in the *ELC* are predicated upon an array of proprietary software plugins in order to be rendered viewable in a commercial browser environment—primarily *Java*, *Shockwave*, and *QuickTime*—whilst the works of ‘interactive fiction’ listed, such as *Galatea* and *Bad Machine*, require the reader to install a standalone piece of specialist software in order to actualise their constituent data files (in this case, the *Gargoyle* interactive fiction reader). The game derived *New Word Order* is predicated also on the reader having access to the original computer game of which it represents a standalone modification—*Half Life*. Should these various software additions be rendered obsolete and unavailable, then it will no longer be possible to access and evaluate those works which require them. This situation is quite unlike that of most traditional forms of printed and manuscript literature, for although various works might be considered over time to be of historical interest primarily, they nonetheless remain accessible to interpretation and criticism in their native form.

A solution to this problematic could involve harnessing specialist ‘emulator’ software that recreates a specific operating environment within the context of another computer system—allowing for software objects to be deployed onto systems that are unable otherwise to facilitate them natively, which is the case frequently when attempting to run older software within a newer environment. Nevertheless, whilst the use of emulators can provide a viable method of accessing older works into the far future, their use would represent a significant change to the context in which such works are actualised and received, particularly when compared to more recent examples that can take advantage of the possibilities afforded by contemporary digital infrastructures. It is for this reason that the principal attributes associated with digital literature as an analytical category are bound to a very great extent upon the particular sociotechnical matrix in which it is being developed and investigated—changing and evolving over time in line with its enabling paradigms. Such broader evolutionary changes in digital infrastructure are reflected by the diverse array of technical and formal configurations on display across the two extant volumes of the *ELC*, which encompasses a time period ranging from 1986 to 2010.

When these various problematics are taken together, the picture of digital literature presented by the *ELC* is one in which multiplicity and transformation characterise every aspect of its constituent texts, as well as the broader contexts

in which they have been developed, received, and understood. The plurality of technical and formal attributes on display across the listed works, the often significant levels of mutability in their outputs, and the varying rates at which they will fall eventually into technical obsolescence, undercuts any sense of a stable, coherent genre that is reducible to a single, overarching definition. Instead, it is suggestive of a transient, processual phenomenon whose diverse qualities can be elucidated best within the context of more localised frames of critical reference. Stated simply, digital literature, at least as it manifests within the *ELC*, confronts the critic with a spectrum of objects and supporting practices that encourage a pluralistic approach towards their analysis, rather than the pursuit of monistic understandings and definitions. It is unsurprising therefore that scholars like Engberg have observed such a diverse array of descriptors and terminological distinctions used by various researchers in the field—all of whom are seeking to delineate their own particular framing of the intersection between digital technology and literary production, as it occurs within specific contexts and case studies. Nevertheless, the very existence of archival resources such as the *ELC*, as well as of generic labels such as digital literature, still raises the question as to what extent these divergent, fluctuating works can be related to one another within the context of a broader analytical approach—and by extension, which, if any, of these implied relations might be sustainable over time. Although the answers generated cannot be presented as being exhaustive accounts of what the category of digital literature might encompass, they provide nonetheless a provisional justification for the critical efficacy of such groupings in the first instance.

One response to the question of approaching digital literature as a genre category is to consider the technical and cultural processes through which different works have arisen and are sustained—that is, to explore the convergence of various trends in art and technological development as they enable a particular field of creative activity, and so evaluate how the objects and practices arising can bear out these conditions of production. This approach provides a pathway for treating the diversity and mutability of digital literature as less a barrier to understanding and instead as a marker of a range of developmental trends that are carried through multiple objects. By acknowledging the evolving technological landscape and the emergent complexity of many digital literary works, this approach can delineate the matrix from which the art

form has emerged without suggesting a set of unchanging fundamentals behind its material functioning and possible meanings—beyond a predication on the functional principles of digital computing technology. Instead, it provides a critical framework that seeks to realise the heuristic potential of this highly mutable art form as an indicator of the processes shaping the contemporary technocultural environment.

This type of materially oriented approach towards the analysis and interpretation of digital literature has a precedent in the history of the critical field it supports, and it is in response to some of these efforts, both historical and contemporary, that the particular stance deployed within the space of this thesis has been developed—specifically, in relation to the work of Espen Aarseth, Matthew Kirschenbaum, and N. Katherine Hayles. It is here, therefore, that this discussion will turn now towards evaluating their extant approaches, and so delineate the context in which an enhanced critical framework can be justified.

1.2. Approaching Digital Literature

1.2.1. Aarseth

In his formative exploration of the relations between technology and textual expression *Cybertext: Perspectives on Ergodic Literature* (1997), the media scholar Espen Aarseth outlines a model for understanding two interrelated classes of text in which the medium constitutes ‘an integral part of the literary exchange’—‘cybertext’ and ‘ergodic literature’ (1). Aarseth employs the latter to describe instances where ‘nontrivial effort is required to allow the reader to traverse the text’—in the sense that she is required to make conscious decisions regarding her sequences of traversal, such as when tracing encyclopaedic references, as opposed to moving simply her eyes or turning periodically a series of pages (2). Taking his cue from the field of cybernetics, Aarseth coins the term ‘cybertext’ to designate a particular manifestation of ergodic literature, in which the mechanical organisation of the text—its configurative potential and the output sequences it enables subsequently—is governed by a series of rules, enabling it to respond in a calculated way to the reader’s actions, and so establish a feedback loop between them. The mutability of a cybertext is consequently unlike the semantic ambiguity of a traditional literary text, for whilst ‘all literature is to

some extent indeterminate, nonlinear, and different for every reading', and 'the reader has to make choices in order to make sense of the text', a cybertext is a 'machine for the production of variety of expression', capable of being reconfigured mechanically in myriad potential ways:

[W]hen you read from a cybertext, you are constantly reminded of inaccessible strategies and paths not taken, voices not heard. Each decision makes some parts of the text, and others less, accessible, and you may never know the exact results of your choices; that is, exactly what you missed. This is very different from the ambiguities of a linear text. And inaccessibility, it should be noted, does not imply ambiguity but, rather, an absence of possibility—an aporia. (3)

Despite arguing here for the differences between cybertext and otherwise conventional printed literature, Aarseth is quick to emphasise that he is not seeking to highlight a new artistic genre, but to outline a perspective that can be used to 'describe and explore the communicational strategies of dynamic texts'—an analytical device that delineates certain functional principles that are shared between otherwise diverse objects (5). To illustrate this point, Aarseth cites a variety of non-computational cybertexts as precursors to more contemporary works, such as the *I Ching*, the *Calligrammes* (1918) of Guillaume Apollinaire, Mark Saporta's *Composition Number 1, Roman* (1962), and Raymond Queneau's *Cent Mille Millions de Poèmes* (1961)—all of which afford the reader myriad options through which they can be configured mechanically, and thus, perceived and understood (10).

Aarseth's focus on the material capacities of the medium as it affects the scriptural outputs it might yield is of significance to this discussion because it established several principles that have informed many subsequent analyses of digital literature—namely, his delineation of the textual medium as a source of expressive agency in its own right; an emphasis upon a continuum of such agency across paper and digital media; and a delineation of the role of criticism in framing these capacities so as to elucidate greater technocultural processes. These perspectives open a pathway towards evaluating digital literary artefacts as a product of longstanding technical and cultural trends, rather than being entirely novel eruptions within human creative endeavour, as well as suggesting

how their functioning expresses these antecedents, even as it advances them. One contemporary analysis that develops Aarseth's call for acknowledging the history and the mechanics of the medium is provided by the media critic Matthew Kirschenbaum in *Mechanisms: New Media and the Forensic Imagination* (2008), which details an approach towards new media artefacts that concentrates on the specific socio-technical infrastructures that enable them.

1.2.2. Kirschenbaum

The basis of Kirschenbaum's analysis is a critique of the 'medial ideology' prevailing in contemporary expositions of new media artefacts, in which they are depicted as being 'ephemeral', or 'somehow inherently unstable and always open to modification', or are 'always identical copies of one another' (17, 36). Kirschenbaum rejects these notions as misunderstandings perpetuated by a rhetoric that reduces new media to 'an essentially symbolic rather than inscriptive exchange among a set of operational metaphors and the "electronic elements" on the screen', as opposed to being an effect of concrete, specific mechanisms that stretch far beyond the apparent boundaries of a particular computer and its reader (41).

In seeking to correct this attitude, Kirschenbaum develops a new conception of digital artefacts that turns on a distinction between 'forensic' and 'formal' materiality. Kirschenbaum's conception of 'formal materiality' is derived from the 'principle of individualization' underpinning modern forensic science, in which 'no two things in the physical world are ever exactly alike' (10). This stance demands an intensive focus on the specific structures constituting a particular physical phenomenon—which, in the case of digital objects, can encompass scales ranging from the 'micron-sized residue of digital inscription' on hard disks, to the globalised networks of computer manufacture and the politics of e-waste management in third-world nations (10).

Following on from the specificity demanded by forensic materiality is that of formal materiality, which Kirschenbaum defines as the 'imposition of multiple-relational computational states on a data set or digital object'—that is, the way in which digitally encoded objects can take on different forms depending on the particular software protocols and processes applied to their actualisation (12). Kirschenbaum deploys the example of digital images to illustrate this point,

highlighting how certain image files can be commanded to reveal their underlying textual metadata by using suitable image viewing software. It is in exploring the relations between forensic and formal materiality at different levels that Kirschenbaum evaluates the material and logical specificities of the matrix from which all digital artefacts emerge, are sustained, and actualised in practice, whilst acknowledging concurrently the range of different possibilities this matrix affords in each instance of digital expression.

Kirschenbaum's insistence on rigorous technical specificity serves, in part, as a call for critical constraint when analysing digital artefacts—to ground any observations made in relation to particular configurations of hardware and software, as well as to account for the specificities shaping these components in turn, including their developmental histories. Kirschenbaum's application of his approach to three early instances of digital literary expression—*Mystery House* (1980) by Roberta and Ken Williams, *afternoon, a story* (1987) by Michael Joyce, and *Agrippa* (1992) by William Gibson and Dennis Ashbaugh—illustrates its value for explicating various characteristics that are not engaged explicitly by a given work, such as the design processes behind their emergence, the subtle contrasts between different published versions of the same software, and the varying material conditions in which they have been reproduced and disseminated to a wider audience.

Despite the undoubted rigor of Kirschenbaum's analysis, there are two points of critique that can be raised against its forensic technical focus. In her review of *Mechanisms*, the artist and textual theorist Johanna Drucker cautions against its potential implication that digital art and literature is to be evaluated solely in terms of its particular mechanisms of operation, arguing that the early works studied by Kirschenbaum are amenable to such levels of technical analysis for they lack the literary qualities necessary to merit their extended reading as 'literature' in the first instance—their primitive functioning limiting their capacities for complex literary expression (par.10). Drucker acknowledges that although these early works serve Kirschenbaum's argument well, future investigations will require texts with richer literary qualities that demand close attention in their own right—as being affected by, but not serving merely as an indicator of the underlying technology (par.10).

A secondary critique of Kirschenbaum's approach is suggested in part by Drucker's contention that it should not be expected of every digital scholar to

engage her chosen artefacts with the level of forensic detail Kirschenbaum dedicates to his chosen examples—given the challenges involved in gathering and deploying correctly the tools necessary for this end, such as ‘hex editors’ for unearthing the specifics of machine code, as well as the extensive detective work involved in tracing the developmental histories behind published software (par. 9). Such challenges will only grow in confronting the highly complex packages comprising the majority of modern software, whose constituent files may not be grouped into a single installation block, but stored across multiple servers as part of a broader network—necessitating the tracing of potentially thousands of disparate software artefacts, and the deployment of numerous specialist tools for their analysis. Moreover, in the case of propriety digital technologies, or instances where an author may be resistant to having the technical aspects of her work being decoded and made accessible, legal and ethical factors must be evaluated prior to any detailed examination. Finally, in the case of web based digital texts, such as those listed in the first and second volumes of the *ELC*, there may be instances in which the underlying digital files are not available for download, or the work is documented as a video recording of an installation that has been dismantled since—ensuring the technology can only be explored indirectly. Although such difficulties may not be insurmountable, they can present logistical challenges that place a truly forensic analysis out of reach for most scholars.

Leaving aside these objections, Kirschenbaum’s call for acknowledging the mechanisms driving digital artefacts is not an invalid one, given their foundational role in enabling and sustaining the empirical encounters they yield, and the rigour in which he pursues his analysis serves to reinforce this basic point. Nevertheless, an alternative critical path can be found in the work of N. Katherine Hayles, in which a rigorous understanding of the medium is gained through a close reading of the expressive surfaces it makes available to the reader—an approach that she delineates in two key texts: *Writing Machines* (2002) and *Electronic Literature: New Horizons for the Literary* (2008).

1.2.3. Hayles

In *Writing Machines*, Hayles presages Kirschenbaum in critiquing the lack of engagement in literary studies with the materiality of textual artefacts—arguing that whilst ‘art history has long been attentive to the material production of the art

object, literary studies has generally been content to treat fictional and narrative worlds as if they were entirely products of the imagination' (19). Writing in the early 2000s, Hayles observes that such attitudes were becoming untenable in the face of proliferating digital information technologies, whose functioning and expressive potential is very different from that of traditional printed texts. It is here that Hayles describes an alternative approach towards the analysis of both traditional and digital forms of literature, an approach that she encapsulates in two key concepts: 'technotexts' and 'media specific analysis' (MSA).

Echoing Aarseth's use of cybertext, Hayles deploys the term technotext as a way of framing critically a body of artefacts that evidence both the need and the value of re-assessing literary texts in material terms—although in contrast to the scholarly impetus behind the work of Aarseth, Hayles is less interested in highlighting simply the mechanical functioning of different texts, but to consider its relationship with the narrative, semantic, and thematic properties of the literary outputs yielded. Hayles' category of technotext is consequently broader than that of cybertext, delineating 'Literary works that strengthen, foreground, and thematize the connections between themselves as material artifacts and the imaginative realm of verbal/semiotic signifiers they instantiate'—opening 'a window on the larger connections that unite literature as a verbal art to its material forms' (25). Whilst Hayles acknowledges that not all texts seek to foreground their materiality, the very existence of technotexts illustrates how literature does not operate in the abstract, but is articulated through an array of materially grounded phenomena, both technical and cultural. Going further, Hayles describes technotexts as revealing this materiality to be a contingent rather than absolute quality, for although the 'physical attributes constituting any artifact are potentially infinite [...] a technotext will select a few to foreground and work into its thematic concerns' (32-3). This provisional framing suggests how the apparent materiality of all literary artefacts, and what this can be understood to mean, is considered best an emergent property, crystallised within the space of particular aesthetic and critical encounters:

[M]ateriality cannot be specified in advance, as if it preexisted the specificity of the work. An emergent property, materiality depends on how the work mobilizes its resources as a physical artifact as well as on the reader's interactions with the work and the interpretive strategies she develops—

strategies that include physical manipulations as well as conceptual frameworks. In the broadest sense, materiality emerges from the dynamic interplay between the richness of a physically robust world and human intelligence as it crafts this physicality to create meaning. (33)

As summarised in the above passage, Hayles considers the materiality of literary artefacts to be not simply an array of fixed attributes awaiting critical elucidation, but a matrix of potential forms and meanings that are enacted as part of the reader's engagement with the text—with technotexts offering particularly vivid instances of this dynamic. Hayles' subsequent conception of a media specific analysis is predicated upon approaching literary materiality as an opportunity to explore, rather than define once and for all, the specific factors, both technical and conceptual, that facilitate and govern its expressive potential—and so engage with the full spectrum of attributes constituting literary art:

Understanding literature as the interplay between form, content, and medium, MSA insists that texts must always be embodied to exist in the world. The materiality of those embodiments interacts dynamically with linguistic, rhetorical, and literary practices to create the effects we call literature. (31)

Hayles' stance in *Writing Machines* represents a significant expansion of the basic principles established by Aarseth a few years beforehand, bringing together an awareness of the specificities of the medium with an evaluation of how it colours the literary outputs it supports. In *Electronic Literature: New Horizons for the Literary*, Hayles extends her approach to consider the relations between medium, form, and content not simply in terms of how these govern the encounter with the reader, but how the relationship between reader and text offers a window into the deeper processes characterising the contemporary digital world—a stance that she encapsulates in the term 'intermediation'. Hayles outlines her conception of intermediation thus:

In electronic literature, this dynamic is evoked when the text performs actions that bind together author and program, player and computer, into a complex system characterized by intermediating dynamics. The computer's

performance builds high-level responses out of low-level processes that interpret binary code. These performances elicit emergent complexity in the player, whose cognitions likewise build up from low-level processes interpreting sensory and perceptual input to high-level thoughts that possess much more powerful and flexible cognitive powers than the computer does, but that nevertheless are bound together with the computer's subcognitive processes through intermediating dynamics. (56)

To unpack this description, Hayles delineates a chain of concrete and conceptual links between the material performances enacted by a computer and its human reader, in which simple, low level processes on the part of both cumulatively enact higher level behaviours that interpret, adapt, and reconfigure one another within the space of their mutual engagement. Throughout the encounter, different material structures and processes mediate the feedback cues generated at each level in the chain—technical, biological, cognitive—and these can be understood as having specific effects on the subsequent unfolding of the exchange, even if their exact contribution cannot be isolated and identified fully. The resulting matrix of intermediating actions between human and machine is, for Hayles, the dynamic through which meaning is expressed and interpreted within the digital literary encounter, as well as across the digital world more broadly. Hayles uses the example of software programmers in this regard, who engage experimentally with the possibilities afforded by different programming languages and data sets, and who must have their own perceptual and cognitive capacities shaped in turn by these nonhuman formations if they are to perceive and then actualise the potential at hand (57). It is for these reasons that Hayles considers the material processes of intermediation between human and machine as being enacted prominently within technotexts such as digital literature, allowing them to demonstrate how such processes characterise the relations between material entities, both human and non-human, across the modern world.

Hayles' account of digital literature in *Writing Machines* and *New Horizons for the Literary* represents less a specific critical methodology than a perspective designed to draw links between the medial and scriptural attributes of textual artefacts and the technocultural environment from which they have emerged and are sustained. Echoing the approaches defined by Aarseth and Kirschenbaum, Hayles is less concerned with establishing an absolute definition of her objects of

study, but to offer a provisional critical framing of digital literature that is subject to revision on a case by case basis, accounting not simply for the objects in question, but also the particular contexts in which they are produced and investigated. Hayles' outlook is consequently similar to Kirschenbaum's in that it does not specify which of the countless material structures and processes necessary to actualise any digital artefact are to be prioritised for examination—encouraging the scholar to select which of those she deems most suitable for her investigation, whether to explore the most distinctive attributes of the artefact in question, or to consider the wider matrix from which it has emerged and is sustained.

Nevertheless, there is one aspect to this methodological openness that is not considered so expressly in the writings of both critics, and this concerns the political impulse behind the undertaking of a digital literary analysis in the first instance—particularly regarding how it informs the approaches taken and the characteristics selected for study. Kirschenbaum and Hayles, as well as indeed Aarseth, frame their investigations as correcting a dematerialising rhetoric characterising contemporary analyses of literature and digital technology, and in this respect they are concerned primarily with engaging and reforming the critical dynamics of their particular field of study. As a consequence, however, there is less attention paid to broader questions concerning the greater political impact and social value of conducting close, detailed explorations of digital artefacts, beyond gaining a better understanding of how they function, the possibilities of expression they can afford, and of their location within a broader technocultural landscape. In the case of Kirschenbaum's forensic approach, any additional benefits accrued concern how digital artefacts might be preserved into the future, and so provide a resource for a more historical conceptualisation of the contemporary digital environment—aiding in the identification of long term trends, and so informing better the decisions taken in the present with regards to the design, development, deployment, and reception of digital technologies, thus empowering potentially those who shape its future and manage its impact.

Regarding Hayles' analysis, the political potential of her approach is significantly more apparent, in that it involves acknowledging the non-human structures and processes that govern human engagements with the observable world, particularly as these manifest within the spaces generated by digital infrastructure. Hayles describes the implications of this stance as one in which

the concept of computation becomes ‘a powerful way to reveal to us the implications of our contemporary situation’—ceasing to be a purely technical practice, and instead becoming ‘a partner in the coevolving dynamics through which artists and programmers, readers and players, continue to explore and experience the intermediating dynamics that let us understand who we have been, who we are, and who we might become’ (157). Digital literature represents thus a mode of creative and critical practice in which experiments are conducted regarding different aspects of the technical, conceptual, biological, and social forces constituting digital activities, objects, and environments—providing a space in which enhanced understandings, and, more implicitly, practical interventions into these dynamics can be articulated. Nevertheless, in outlining the critical justification for conducting expansive, politically significant readings of specific digital literary texts, Hayles leaves open the wider question of what political vectors might be carried across the genre as a whole—of the resonances shared between the crystallisations afforded by various instances, and of what these might represent collectively, beyond revealing the existence of complex intermediating processes.

These larger questions concerning the overarching political value and social impact of reading digital literature, and the role of the critic in fostering this potential, can appear to invoke debates that go far beyond the more immediate, practical concerns of how digital literary artefacts are to be engaged and understood critically. Nevertheless, these questions can inform the foundational assumptions upon which more specific approaches can be developed and tested. Whilst the multiplicity of forms characterising digital literary artefacts encourage a plurality of critical strategies, as well a degree of openness and adaptability at the level of their application, the assumptions underpinning which approaches are selected for scholarly use—and thus, which of myriad observable characteristics are deemed significant—depend ultimately on broader goals that can range from making a delimited contribution to an extent field of research up to a more radical attempt at influencing the political, cultural, or social environments in which it is conducted—and so emulating more directly the political activist and creative practitioner than the scholarly critic thereof.

It is with regard to exploring this more radical line of thinking that this thesis is concerned, considering how digital literature presents alternative ways of approaching and then engaging with the contemporary digital milieu. Over the

course of the following chapters, these texts will be discussed not simply as highlighting their status as digitally articulated objects, but as encouraging critical thought concerning the processes by which they are enabled and sustained. This allows in turn for their status as creative redeployments of extant technocultural forms to be made more apparent, and thus suggest how the assumptions and practices underlying these processes might be re-oriented at a larger scale. This thesis presents not a set methodology for articulating this potential, but offers a critical perspective and supporting vocabulary that can be applied flexibly to a range of observable characteristics as they manifest across specific texts.

1.3 Argument Synopsis

By way of outlining the argument ahead in more specific terms, this final section summarises briefly the key ideas that will be developed and deployed over the remaining chapters. In seeking to connect an exploration of the technology of digital literature, as it is experienced by the reader, with a perspective that evaluates the critical and political import of this intersection, this thesis presents what it labels a 'performative' approach towards digital literary texts, in which they are depicted as staging a performative exchange between human and machinic agencies. This conception of a performative exchange is derived from certain trajectories of thought apparent in the sociology of science, notably those of Andrew Pickering, in which the material world is understood to be in a state of continual emergence, as enacted through an entangled network of agencies, both human and nonhuman. Pickering thus presents the act of knowledge-making to be implicated always in the fostering of change, as a negotiated reconfiguration of different energies and materials along particular vectors, seeking to articulate them in ways that are consistent sufficiently as to constitute a comparatively stable frame of reference. From this standpoint, knowledge is neither catalysed, nor sustained, nor communicated in the abstract, but is enacted through material practices that reshape the environment from which it emerges and seeks to reference.

The second chapter of this thesis 'Explorations' delineates how Pickering's work explores this depiction of knowledge-making, which he terms the 'performative idiom', as it manifests within the practices through which scientific equipment is developed, deployed, and transformed as part of the experimental

process: what he calls a ‘dance of agency’ between human and machine, whose unpredictable outcomes he labels the ‘mangle of practice’. Going further, in an extended study of cybernetic thought and practice, Pickering explores how, when the mangle of practice is taken as an end in itself, rather than as a problematic to be overcome, it constitutes a new way of approaching the world more generally. This ‘nonmodern’ mode is one where the gaining of absolute knowledge and control over different phenomena is dropped in favour of an open-ended, experimental engagement that seeks to ramify the world’s potentialities of action and expression—accepting disruptions and breakdowns in the process as opening up new paths of practice and insight. For Pickering, cybernetic projects serve as striking examples of this approach in action: developing machines whose adaptive behaviours are often productive of novel insights, activities, and perspectives that would otherwise not have been possible using a hypothesis lead, goal oriented approach. It is this property that allows these projects to act as small-scale instances of the types of endeavour that arise from a nonmodern mode of knowing and being, what Pickering refers to as ‘ontological theatre’.

In defining the relationship between the reader and the text in the digital literary encounter as a performative exchange of agency, this thesis adapts Pickering’s critical vocabulary to describe not only how these texts achieve their particular effects, but to evaluate them in the context of the agential exchanges taking place across the technocultural environment more broadly. It is through this comparison that digital literary texts are evaluated subsequently as modelling a nonmodern heuristic—as creative endeavours that facilitate the open ended exploration of their expressive potential, and are thus instructive of what a nonmodern understanding of knowledge-making resembles. A performative analysis of digital literature is thus shown as being able to elucidate not only its emergent characteristics as a form of artistic production, but to consider the progressive vectors these express in the process.

By way of linking the critical imperatives governing a performative understanding of digital literature to the scriptural outputs yielded by specific texts, the second chapter concludes by relating Pickering’s observations back to the early work of literary critic Jerome McGann, who, alongside the poet Lisa Samuels, describes the act of textual criticism as ‘deformative’ in constraining the myriad potentialities of a text into a specific interpretation. McGann develops this account as it applies to the task of computer assisted textual analysis, contending

that to manipulate digitally the documentary features of a text so as to articulate it in different forms, and thus provide different catalysts for critical insight, represents an extension of the deformative critical process—the speed of digital manipulation, however, allowing a text to be evaluated more fully in terms of its potential for meaning, than as a singular, stable body of expression. McGann applies this thought subsequently to purely digital texts, whose formal and scriptural characteristics can be reconfigured in the real time of reading, and it is through this insight that the practices of textual criticism, as a deformative undertaking, can be connected to the performative digital literary encounter, where the real time manipulation of a text's formal characteristics acts as a key driver of experimental, interpretative possibility.

In demonstrating the critical efficacy of reading digital literature using a performative framework, the remaining chapters of this thesis present extended case studies into three major subclasses of the genre. The third chapter 'Engagements' examines texts that deploy different strategies for incorporating the reader's inputs when configuring their resulting outputs, and thus illustrate the basic tenets of a performative analysis. The fourth chapter 'Articulations' considers texts that eschew the reader's agency once accessed to generate their outputs autonomously, emphasising the configurative and expressive powers of digital algorithmic structures, and so encouraging critical reflection concerning what a performative literary encounter resembles in these instances. The fifth chapter 'Applications' explores texts whose contents are engaged explicitly in the discourses of contemporary scholarship, placing the medium into dialogue with their critical concerns so as to structure and present them in ways that help crystallise their key tenets, interrogating subsequently how the functional characteristics and operational cultures of digital technology intersect with the topics discussed. A concluding sixth chapter offers a short survey of some of the very latest developments in digital literary expression, describing key trends in the current evolution of the genre, and so considering how a performative critical approach can tackle these developments as part of future investigations.

Each of these case studies reveal how a performative approach can tackle the diverse characteristics exhibited across many specific texts, considering the problematics they present, and how these can be worked through critically. In particular, the analyses presented tackle the question of how a nonmodern understanding of digital literature engages with those aspects that ostensibly

undermine and problematise this perspective, namely the tightly delimited architecture of digital computing systems, whose stability and rigidity appears inimical to the emergent, experimental dynamic of nonmodern thought and practice. The conclusion reached is that although these systems are fully knowable and mechanically stratified at a low level, their ability to generate unpredictable output sequences is indicative of how emergent dynamics are carried through the evolving intersection of multiple, interdependent agencies—such as those involved in creating and actualising a digital literary artefact. This is revealing of how technological structures, and the functional principles they express, are not absolute once they are crystallised into being, but are sustained and articulated through numerous processes, which can result either in their unravelling, or their transformation into new forms entirely. Digital literary texts thus stage the interplay between structure and emergence as it is maintained through the performances that enact the contemporary technocultural environment. Nonmodern experimentalism is conducted within this environment, exploring and then enacting the different possibilities afforded by extant structures and practices, and it is here that digital literature can be read an example of this type of endeavour, both in terms of its creation in the first instance, and through the exploratory, emergent reading encounters it facilitates.

2. Explorations: Developing a Performative Approach

This second chapter is concerned with outlining the key principles, terminology, and conceptual frameworks necessary to analyse digital literature from a performative critical standpoint, with the encounter between the reader and the text depicted as an entangled exchange between human and nonhuman agencies in real time. As outlined previously, this approach offers not simply a novel description of the material structures and processes that characterise the digital literary encounter across diverse instances, but suggests how these attributes can be read as being significant politically—as modelling the kinds of activities and artefacts that can arise from acknowledging the role of nonhuman agencies in shaping human knowledge-making practices. This chapter establishes thus the critical foundations upon which the close analyses in subsequent chapters will be conducted.

The opening sections of this chapter outline the basic tenets of a performative conception of human and nonhuman agency, as expressed through technology, prior to examining in detail the work of the sociologist of science Andrew Pickering, whose books *The Mangle of Practice: Time, Agency, and Science* (1995), and *The Cybernetic Brain: Sketches of Another Future* (2010) explore the role of nonhuman material agencies in shaping the initial goals and eventual outcomes of scientific research. It is here that Pickering develops a broader conception of the observable universe that he characterises as being performative in its depiction of human agency as entangled inextricably with nonhuman structures and processes. In exploring Pickering's work, the chapter evaluates the ways in which his particular vision of knowledge-making can help articulate the material performances enacted through digital literary artefacts—in terms of how the reader comes to know and to engage the expressions of agency manifested by the text, how the texts themselves rework creatively the extant technical matrices of which they are part, and, moreover, what these characteristics suggest regarding how the contemporary technocultural environment can be approached and evaluated more broadly in both creative and critical practice.

Having detailed the principal implications of Pickering's work for conceptualising the performative characteristics of digital literature, the chapter then considers the applicability of these insights for the task of reading critically

the output forms expressed by specific texts. For this end, the discussion highlights the work of the literary critic Jerome McGann, whose compendium of essays in *Radiant Textuality: Literature After the World Wide Web* (2001), documents his efforts at examining codex literature in light of digital text by considering how the semantic qualities of literary forms are shaped by the medium in which they are conveyed—an enfolding of materiality and meaning that has significant implications for the act of critical interpretation. McGann’s conception of the medium as an active rather than passive component of the literary encounter, and his deployment of ‘deformative’ experimental criticism for capturing its dynamic attributes, is shown as being instructive for the task of evaluating the performances of digital literature. In so doing, this chapter demonstrates that a productive critical dialogue can be fostered between the work of Pickering and McGann, with the latter serving as a way of relating the insights of the former to the concerns of literary analysis. It is from this exchange that the essential elements of a performative critical approach towards digital literature are established.

2.1. Performing the Material World

2.1.1. Nonhuman

In the introduction to his book *Entangled: Technology and the Transformation of Performance* (2010) the artist Chris Salter outlines the recent emergence of ‘performance’ as a key paradigm for understanding contemporary practices of knowledge-making—with the emphasis of the 1990s on the ocular, the abstract, and the virtual giving way to a renewed consideration of material processes, immanent experiences, and embodied enactments.

Salter describes the performative worldview in particular as one in which ‘there is not a reality pre-given before one’s experience but rather that the world is enacted or actively performed anew’ (xxvi). From this standpoint, a performative conception of knowledge-making carries two interlinked implications. Firstly, it depicts the observing subject as an integral component of the environment that she seeks to understand, and so her efforts at developing and communicating these understandings are performed as part of her engagements with it in real time. As a consequence, the creation of knowledge is implicated in the fostering of change in the world—in the arrangement of energies and materials so as to establish particular frames of reference and understanding, and thus constituting the agential capacities of the observing subject and the studied object within the space of their reciprocal entanglement.

Here, the image of an abstract subject reading from afar the inherent properties of a passive object—and thus, the underlying notion of a stable reality that pre-exists and gives shape to both—is replaced with a vision of a world that is in a state of constant reconfiguration, in which ‘subjects and objects have not yet come into being and, even if materialized, are always in a constant state of flux and transformation that is unstable and difficult to repeat’ (xxvii). The performative worldview is one therefore in which the exploration, articulation, and transformation of the world forms part of one and the same process, with knowledge, its creation and its expression, never articulating the world from a point of absolute exteriority, but as emerging from and engaging always in the process of its becoming.

By way of grounding and unpacking further these expansive ideas so as to suggest their applicability to the task of reading digital literature, it is worth citing

Salter's contention that the performative emphasis on the materiality of knowing and being offers a ready path for reconsidering the role of technology as both a mediator of human activity and as a source of agency in its own right, for not only do machines and scientific apparatuses 'perform in terms of their efficiency or benchmarks [...] they also perform by expressing things through material transformations that do things to the world' (xxiii). However, Salter observes that 'performance studies has largely been a human-centered affair', failing to account adequately for the entangled relations between human and machines as they manifest within contemporary scientific and artistic practices (xxvii). It is for this reason that he turns to the work of a number of theorists from within the field of 'Science and Technology Studies' (or 'Science, Technology, and Society'—'STS') as leading the way towards understanding 'the complex entanglements among natural, social, technological, and corporeal forces that help shape the world', with their analyses of the material practices underpinning scientific conduct displacing 'humans as the sole producers of knowledge, the expressers of agency' in the world (xxvii).

Two figures that Salter highlights in particular are the sociologists of science Bruno Latour and Andrew Pickering, who develop explicitly performative conceptions of contemporary technoscientific practices and their products. For Latour, working in conjunction with sociologists John Law and Michel Callon, scientific knowledge, and the structures through which it is established and sustained, is constituted through a developing network of agencies, both human and nonhuman, whose properties, characteristics, and status within this conjunction are subject to constant reconfiguration as they evolve and transform in line with the network as a whole. These myriad entities are termed 'actants', and the distributed matrices of which they are part 'actor networks'—so constituting what is referred to often as 'Actor Network Theory' (ANT), which Salter summarises as 'an attempt to understand the role that material practice plays in scientific creation: how things are done rather than how they are described, once again marking out the territory between representational versus performative knowledge' (xxviii). The comparative novelty of ANT lies in its emphasis upon a symmetry between human and nonhuman agency in the assembly of scientific knowledge—representing a distinct shift away from an earlier body of research, encapsulated as the 'Sociology of Scientific Knowledge' (SSK), in which scientific endeavour was considered as being structured and

constrained primarily by human thought and action, over and above the instruments and apparatuses employed (Salter xxviii). From this standpoint, the use of the term 'performative' to describe the entangled exchanges constituting scientific practice is apposite: emphasising the continual agency exhibited by the actants involved, whether human or nonhuman, in articulating the world in such a way as to reveal its networked capacities of action and expression.

In his book *The Mangle of Practice: Time, Agency, and Science* (1995), Pickering credits ANT as a pioneering effort at developing a performative account of the relations between the human and the nonhuman within scientific practice, but he is critical of Latour and Callon's subsequent characterisation of these relations as manifesting along semiotic lines—as associative formations that move fluidly between material structures and conceptual assemblies depending on the configuration of the network in which they are embedded, enabling nonhuman agencies to be understood as distinctive actants without eliding their entanglements with human culture (12). Pickering's wariness of semiotics here stems from a perception that it invokes too readily the largely cognitive domain of representational knowledge, undermining the very performativity that ANT seeks to articulate, as well as its implication that the agential capacities of human and nonhuman formations are freely interchangeable (15). Pickering's solution is to track the specific relations between the human and the nonhuman as they crystallise in the real time of practice:

The contours of material agency are never decisively known in advance, scientists continually have to explore them in their work, problems always arise and have to be solved in the development of, say, new machines. And such solutions—if they are found at all—take the form, at minimum, of a kind of delicate material positioning or tuning, where I use "tuning" in the sense of tuning a radio set or car engine, with the caveat that the character of the "signal" is not known in advance in scientific research. (14)

In emphasising the real time performativity of scientific knowledge-making, Pickering presents a way of reading the intersection between human and nonhuman agencies without reducing it to a purely semiotic exchange, whilst also avoiding making prior assumptions regarding the capacity of one agential form or another to shape decisively the evolution and outcomes of these entanglements.

It is by observing how human and machine work upon one another within the space of specific practices that an account can be presented concerning their respective roles and influences at various stages—elucidating the points at which scientists are responding to developments that are irreducible, in both their origin and effects, to human agency alone.

Pickering's work provides the cornerstone of the analysis that follows concerning the performative aspects of digital literature, for it establishes a perspective on human-machine exchanges that enables the encounter between the reader and the text to be examined without privileging one or the other as a key driver of the entangled dynamics that follow—whether in terms of how the encounter unfolds or the way it might be interpreted subsequently. Moreover, in linking the practices of scientific knowledge-making with those necessary to develop, engage, and explore works of digital literature, a critical foundation is established upon which the political significance of these texts can be elucidated more clearly—as meditating on the very structures and processes that produce their enabling technologies, framing them so as to make not only the assumptions behind these practices explicit, but to suggest how both might be reoriented in future. In order to move forward in this regard, the discussion will turn now to summarising the key aspects of Pickering's work, before starting the process of relating his insights to the particular characteristics of extant digital literary texts.

2.1.2. Emergence

Pickering's account of the material and conceptual practices of scientific research is founded on a contrast between what he terms the representational and performative idioms. In *The Mangle of Practice*, Pickering defines the representational idiom as one in which the world of 'people and things tend to appear as shadows of themselves', with scientists and engineers being characterised 'as disembodied intellects making knowledge in a field of facts and observations' (6). From this Cartesian perspective, material phenomena are figured as only being intelligible in terms of the representations produced concerning them, and as Pickering observes this leaves scientific accounts of the world operating from within a matrix of abstracted observations and constructed facts:

The representational idiom casts science as, above all, an activity that seeks to represent nature, to produce knowledge that maps, mirrors, or corresponds to how the world really is. In so doing, it precipitates a characteristic set of fears about the adequacy of scientific representation that constitute the familiar philosophical problematics of realism and objectivity. (5)

To rephrase Pickering's argument in this passage, the representational idiom is concomitant with a vision of 'science-as-knowledge', as a body of abstract representations of the observable universe, and this suggests in turn that the only worthwhile question that can be asked of science is with regards to whether the knowledge it generates corresponds to an objective reality (6). As noted earlier, Pickering considers this vision to have inflected many previous sociological studies of scientific practice, with the immediate precursor to the modern field of STS, the Sociology of Scientific Knowledge (SSK), discussing scientific accounts of the material world in terms of particular configurations of human agency—and thus failing to consider adequately the role of material forces that are irreducible to human activities in the production and utilisation of scientific knowledge.

In recounting his own efforts to move away from the intellectual abstractions and realist fears surrounding the representational idiom, Pickering outlines its conceptual opposite, the performative idiom, in which the world is depicted not as a static body of potential facts awaiting discovery, but as being articulated through acts of 'material agency'—a domain that is 'continually *doing things*, things that bear upon us not as observation statements upon disembodied intellects but as forces upon material beings' (6). In other words, Pickering understands the material world as being enacted continually through concrete forces and processes—whose agential capacities manifest at scales that exceed often those of human minds and bodies unaided. Pickering's deployment of the term 'agency' here works to undermine the depiction established in the representational idiom of a passive material domain that is animated only through the efforts of conscious, human agency—which is recast as a material rather than an abstractly cognitive phenomenon, and thus wielding powers of observation and transformation that are grounded in the material environment of which it is part.

This vision of a dynamic agential universe constitutes the foundation upon which Pickering grounds his depiction of science and engineering as particular strategies for engaging and negotiating with different manifestations of this material agency—highlighting specifically the role of machines and other artefacts and instruments in mediating the exchanges between the human and the nonhuman:

Scientists, as human agents, maneuver in a field of material agency, constructing machines that [...] variously capture, seduce, download, recruit, enroll, or materialize that agency, taming and domesticating it, putting it at our service, often in the accomplishment of tasks that are simply beyond the capacities of naked human minds and bodies, individually or collectively. (6-7)

Pickering's conception of technology here is derived from his understanding of the intrinsic resilience exhibited by the nonhuman material domain against being harnessed unproblematically by human agencies for particular ends—it has to be 'captured' and then 'tamed' through the meticulous development of technological artefacts, not conquered merely. Going further, Pickering explains that it is these same resilient qualities that makes the labour to utilise them worthwhile, for they are able to shape the fabric of the world in ways that cannot be achieved or emulated using the native abilities of the human bodily form. It is these concrete resistances, the practical difficulties involved in negotiating them, and the unpredictable ways in which human intentions and material recruitments become entangled and transformed in the real time of practice, which constitute the critical locus of Pickering's performative account of scientific knowledge-making.

Before outlining how Pickering describes these performative dynamics, and considering their implications for investigating digital literature, it is important to highlight one final aspect of the performative idiom that is implicit in the above passages—the presumption that the observable universe is an emergent, processual formation. As noted, Pickering considers the material world to be expressing continually different forms of agency, but argues through his accounts of scientific practice that the precise configuration of this agency, and the particular ways in which it comes to affect the rest of the physical, cultural, and technological domains, cannot be predicted in advance. Instead, it must emerge

and then crystallise in the real time of practice, either when engaged with other nonhuman energies and materials, or in conjunction with human agencies that are negotiating the resistances presented by these phenomena so as to harness them practically. In the latter instance, technology can be understood as an important conduit through which the human and the nonhuman intersect within the world's becoming—their entangled engagements working to inaugurate new forms of material expression in the guise of machines and other artefacts.

Pickering summarises his approach by arguing that to think of science as a machinic field represents 'a rebalancing of our understanding of science away from a pure obsession with knowledge and toward a recognition of science's material powers'—as an undertaking that is characterised as much by its real time engagements with an agential world as by the conceptual formations that it derives through these activities (7). It is by acknowledging these co-constitutive relations between the performative and representational aspects of science that Pickering seeks to define 'how, in practice, *connections between knowledge and the world are made, and of what those connections, as made in practice, consist.*' (182)

2.2. Encountering Digital Literature

2.2.1. Practice

It is in relation to these emergent vectors of action and expression that Pickering outlines his account of the material performances characterising scientific knowledge-making in *The Mangle of Practice*, and it is through his descriptions that a comparison can be drawn initially between scientific practices and those involved in reading digital literature—providing the foundation upon which a performative critical approach can emerge.

At first, Pickering observes that an important practical correlation exists between human and machinic agency, noting that technological artefacts are enveloped necessarily within a set of practices that are highly disciplined and 'machinelike', for it is only through the meticulous application of standardised gestures and techniques that a machine can safely and consistently perform concrete actions that exceed the native abilities of its human operators (16). Nevertheless, Pickering argues equally that human agencies possess a form of

adaptive intentionality that is unlike the real time performativity exhibited by machines and other forms of nonhuman material agency. Whereas the latter can only ever react to events taking place within their immediate environment—following the imperatives generated by an interlocking matrix of forces and processes—human agents can strive towards an imaginatively transformed version of their present situation, and so act in accordance with an extended temporal framework—seeking to reorient their environment along particular vectors of configuration. However, Pickering observes subsequently that such acts of goal making are reshaped invariably by the material formations that are employed to actualise them in the real time of practice, and it is this entanglement of human goals and nonhuman behaviours that underpins his performative account of science and engineering, as articulated through two key concepts: the ‘dance of agency’ and the ‘mangle of practice’.

Pickering opens his analysis by describing how scientists and engineers work by constructing a theoretical model of a particular aspect of the observable world before assembling a machine that they believe will articulate this model—trying to effect a ‘capture’ of material agency that can be used to supplement their own (21). However, as noted, the emergent vectors of material agency are not subjugated readily to human designs, and so it is not uncommon for the machines resulting to fail to perform in the expected manner initially. These emergent resistances necessitate that human agencies must adjust continually both their conceptual models and the machinery itself in order to pursue the results they were seeking originally, or to modify their goals accordingly. Pickering describes this scenario as one in which ‘human and material agency are reciprocally and emergently intertwined’, with both resisting and reshaping the agential capacities of the other until they become ‘interactively stabilised’—that is, able to effect repeatedly a particular material enactment of the world under measurable conditions, with minimal further adjustments (21).

It is this dialectical exchange between human and machine—the former revising her goals, making adjustments, and then observing the behaviours of the latter—that Pickering designates a ‘dance of agency’ (21). Pickering defines subsequently this ‘practical, goal-oriented and goal-revising dialectic of resistance and accommodation’ as characteristic of all human engagements with the nonhuman material domain, and it is this paradigm that he labels the ‘mangle of practice’—a term that acknowledges the emergent material and conceptual

transformations that occur whenever human and nonhuman agencies are entangled reciprocally in a process of enacting the world (21).

In order to begin the task of establishing the efficacy of Pickering's ideas as a means through which to appraise digital literature from a performative standpoint, it is worth focusing upon the centrality of resistance to his analysis of material agency—the practical difficulties and uncertainties involved in developing the 'successful captures, framings, and interactive stabilizations that characterize the objective contents and products of science' (195-6). For scientists and engineers, these resistances pose significant challenges for establishing novel crystallisations of material phenomena—destabilising continually the machinery through which these phenomena can be effected and then tamed, and disrupting concurrently the envelope of disciplined practices and theoretical frameworks that seek to gain mastery over the situation. Nevertheless, the act of negotiating the resistances presented by the material domain has the effect of bringing novel, emergent forms into the world, often as a result of unforeseen behaviours which then become integral to the experimental process and its underlying objectives—the hallmark of the mangle of practice.

Treating digital literature as another form of machinic apparatus in light of Pickering's analysis serves to generate a number of critical insights. To summarise the key points of the argument ahead, the digital literary artefact can be read as a form of material agency whose potential contours of action and expression are unknown initially from the reader's standpoint—both in terms of the outputs that may be generated over the course of the reading session, as well as the inputs necessary for these possibilities to be realised. As discussed in the previous chapter, the majority of the works listed in the *Electronic Literature Collection* can yield potentially a wide range of output sequences in response to the reader's actions, often with significant levels of unpredictability. This characteristic precludes any two reading encounters from being exactly alike, foreclosing the possibility of predicting their unfolding in advance. Consequently, from the standpoint of Pickering's model, the reader and the digital literary text are invited to enter into a dance of agency, in which the former can only come to know the latter by engaging with it in the real time of practice, generating an emergent encounter that is a joint product of human and machinic agency. Stated in simpler terms, the reader's knowledge of the text must emerge as part of her

role in actualising its expressive potential, engaging with its responsive materiality, rather than studying it from a position of omniscient abstraction.

The principal value of this comparison between the performative knowledge-making practices of scientific research and those involved in the actualisation of digital literary texts is that it demonstrates how the latter can bring into dialogue its narrative, thematic, or semantic concerns with a practical insight into the evolution of the contemporary technocultural environment—of the assumptions informing the development and deployment of these technologies as they emerge into being and then contribute to the emergence of other such forms, before suggesting how these might then be redirected or transformed through particular acts of creative intervention. It is here that digital literature can be read expressly in terms of its wider political implications, a point that will be considered in further detail later in this chapter.

To begin the task of unpacking these key ideas, it can be noted that the initial stages of the digital literary encounter is liable to exhibit an experimental, exploratory dynamic—the reader engaging with the system arbitrarily, observing for the first time the relationship between her inputs and the outputs resulting, and so developing a rough conceptual model of its functional and expressive capacities. At the outset of the encounter, owing to a lack of prior knowledge regarding the expressive potentialities of the text—which are evident rarely at first glance—the reader's actions are concerned with elucidating the present moment by necessity, and so emerge directly in response to the novel behaviours exhibited by the work itself in real time. A simple illustration of this process is provided by Dan Schiovitz's *Bad Machine*, which was discussed briefly in the previous chapter. In this work, the reader is cast as a robotic drone in an automated manufacturing colony, and she is provided with no further information concerning her role and status within this environment—the premise that her character is malfunctioning, operating autonomously rather than obediently, being the only explanation available for this paucity of context. Confronted with an alien environment that is expressed only through an abstract creole of programming tropes, the new reader has no choice but to enter a series of arbitrary inputs, evaluate the outputs resulting, and so assemble gradually her own conception of the logic of the story world and the functional capacities of the software through which it is conveyed (see fig. 11, page 59).

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production / Area 17 / Warehouse IV .N:7^=7..

? x energizer
Energizer-class machine id #<unknown>; surface invent: theoretical
mobility 12.7% (damaged operation) [unit(s): 903 nil nil nil 907 nil,
CPU non-responsive, torso <inaccessible>, head possible use (transfer
possible) [704].

? index 704
KEYWORD: 704
TYPE: Part
SUBTYPE: Headpart
(Standard model) energizer$$HEAD (normal)
Functions_supported: vision(standard),lowlight_vision()
-additional_note: <nil>

? detach 704
##Disconnect {perfr!ed} *PART* re+moved

? get 704
traANS__FER cOMPLETe
[TO south] Salvager-class machine enters from south.

? |

```

Fig. 11. An example of the interface protocols required by the robotic environment of *Bad Machine*. Reader inputs are in green.

Over time, as the possible range of behaviours exhibited by a text such as *Bad Machine* become better understood, the reader can attempt to direct the performative encounter by disciplining her actions in accordance with a temporally extended model of its unfolding—to envision various potential outcomes in response to her inputs, and so make a conscious effort to direct which of these are realised in practice, e.g. when seeking to establish the sequence of commands necessary to actualise an interesting narrative pathway, or when attempting to actualise fresh possibilities within an emerging story world, or even trying simply to generate novel outputs that diverge significantly from those encountered previously. It is in these contexts that the digital literary text will present frequently a pattern of resistances against her agency—to react in ways that run counter to her expectations, either nullifying them entirely, or forcing their revision. Therefore, whilst the reader's evolving conception of the system might suggest the practical accommodations necessary to overcome or exploit these resistant behaviours, it may be the case that she will not realise the reading trajectory that she was seeking to articulate originally, achieving instead a

negotiated outcome that has been structured through an evolving series of machinic resistances to her actions. In the case of *Bad Machine*, the new reader's attempts at exploring the manufacturing colony will result often in her character being detained, reprogrammed, and thus losing its autonomy. Her efforts at reconfiguring this environment in order to render it more navigable can then yield scenarios ranging from the destruction of her character by other robotic agents, to escaping the colony through a variety of means, to wresting control of its central Queen and assuming omniscient power within its bounds. The reader's ability to realise these different outcomes are dependent on her capacity to negotiate successfully a largely hostile, ever changing domain, and in the absence of any contextualising hints, such knowledge can emerge only through a process of trial, error, and the careful tuning of her actions in response to those of the text: a dance of agency between human and machine.

It is through these kinds of reciprocal engagements within the space of the digital literary encounter that human and machinic agency come to work upon one another—defining and delimiting their actions and reactions in relation to an evolving temporal trajectory. Once the reader enters into a dance of agency, the resistances presented by the digital literary text will reshape her conceptual understanding of the work itself, the practical manoeuvres through which this understanding emerges, and the goal structures underpinning them both. These changes will affect in turn the resistances encountered, and so transform the performative exchange between the reader and the text once more.

2.2.2. Resistance

There is one significant caveat that should be appended to the above description of the digital literary encounter, for it marks a key point at which the experience of actualising and coming to know a digital literary text can appear to diverge from the material performances underpinning the practices of scientific knowledge-making. Unlike the open ended dances of agency that typify the case studies evidencing Pickering's analyses in *The Mangle of Practice*—which can emerge eventually into myriad possible forms—the reader of digital literature is engaging with a form of machinic agency that has been pre-disciplined extensively. In other words, it has undergone an extensive developmental process in the hands of its author, who has tamed the vast range of behaviours enabled by the emerging

system—both desirable and otherwise—to create an artefact whose functional parameters are stable and predictable sufficiently that it can be operated repeatedly and consistently by other readers—ensuring also that the performative encounters yielded will evolve along certain lines depending upon the particular narrative, thematic, or semantic qualities sought. Importantly, this pre-disciplining of the exchange between human and machine is confined not just to the digital literary text in the abstract, for the broader technological infrastructures that are necessary to support any work of digital literature—the hardware systems through which it is expressed and the software languages in which it has been encoded—are the product of an even more extensive developmental process, whose outcomes are shaped by far broader socioeconomic concerns, and so constrain what the author can achieve and what the reader can do to actualise a given text.

A traditional example of such technical pre-disciplining is the desktop or laptop computer, which has evolved in concert with the productivity demands of the office workplace environment, and so possesses a particular set of interface attributes that are oriented around the capabilities of screen, keyboard, and cursor. As testified by the shape and structure of the majority of texts constituting the *ELC*, these interface constraints support readily the creation of works whose input requirements are no different from those supporting many commonplace digital activities—such as web browsing, file system management, and document creation. Although this carries the advantage of allowing these texts to be accessible using a wide range of standardised computing platforms, it limits also their ability to enact other forms of human activity that do not engage expressly with digital objects and environments.

Emily Short's *Galatea* provides a simple illustration of these limitations at work. As noted in chapter one, *Galatea* is a work of interactive fiction that places the reader in the role of an art critic who is tasked with evaluating a sentient human statue—inspecting carefully its material attributes and asking it questions in order to ascertain its provenance. Unable to interact with the story world outside of the screen and the keyboard, the reader's ability to inspect the statue is limited to her typed queries and reading the descriptions yielded—a situation that bears little resemblance to how the aesthetic encounter would unfold in the context of an art gallery, standing before a life-size statue (see fig. 12, page 62).

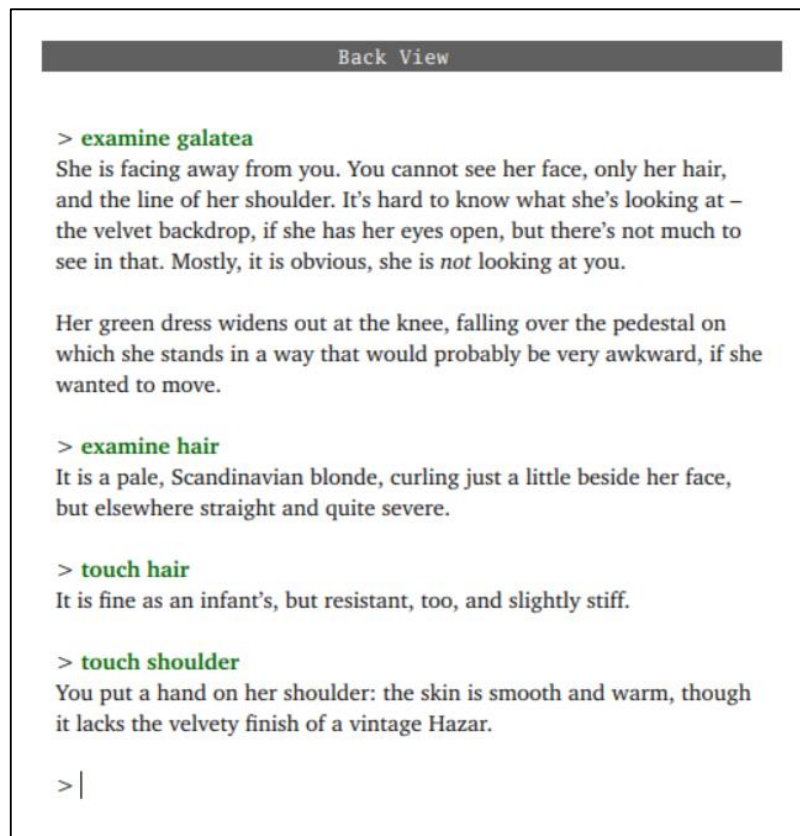


Fig. 12. Examining *Galatea*. Reader queries are in green.

Fitting the Pattern (2008) by Christine Wilks offers another instance in which the supporting hardware falls short of the material performances explored. Wilks' text is a memoir, meditating on her relationship with her mother through their shared interest in pattern dressmaking, and this provides her with a vehicle for relating the creation of a new dress to the emergence of a written narrative—as a sewing together of tailored fragments over time. *Fitting the Pattern* enacts Wilks' correspondence between writing and tailoring by employing an interface metaphor based around various sewing tools, asking the reader to deploy them so as to enact virtually the creation of a pattern dress—every step of this process yielding gradually fresh scriptural fragments (see fig. 13, page 63). Although the reader is required to move her cursor in such a way as to follow the contours of the dress pattern whilst actualising the text, only a very limited correspondence can be sustained between her practical engagements with a digital artefact and those involved in creating an item of clothing using the appropriate tools.

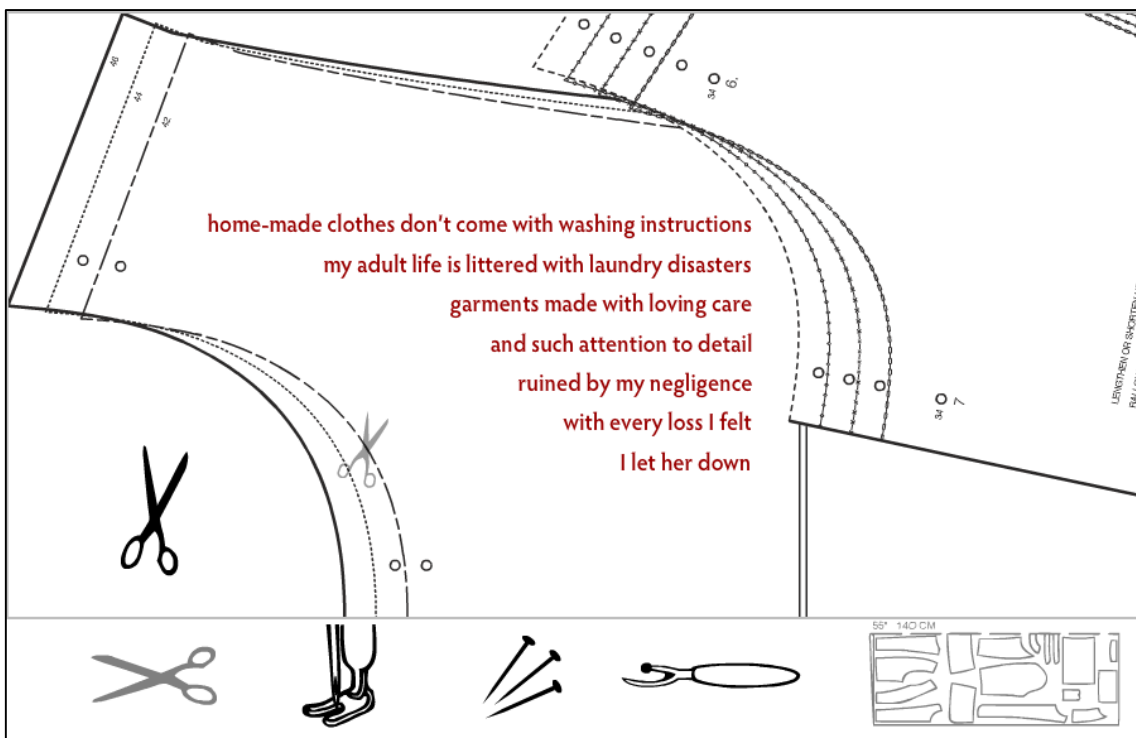
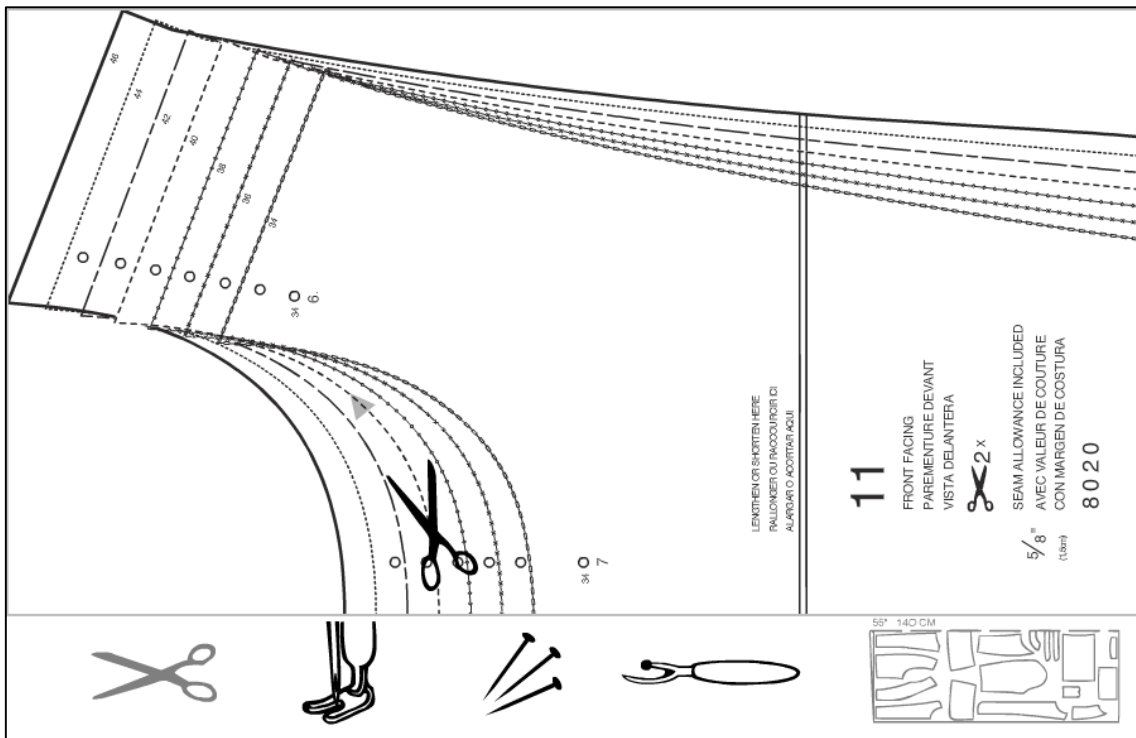


Fig. 13. Two screenshots of *Fitting the Pattern*. Note the tool interface at the bottom, with the scissors being the tool selected currently—this replacing the reader’s standard cursor icon. A ghost image of the scissors, and a guiding arrow, is present on the screen, showing the reader where to place her cursor and how to move it across the dress outline.

Whilst *Fitting the Pattern* and *Galatea* make no pretence as to providing accurate simulations of the activities they cast the reader as enacting, both texts demonstrate how the digital literary performance is pre-disciplined fundamentally by the technical platforms through which it is articulated. As noted previously, one of the key effects of this constraining of the performative encounter is that it delimits the forms that it can take eventually. Once the reader and the text are entangled within a dance of agency, they will exhibit an agential finitude that contrasts with the material performances sustaining pioneering scientific research and technological development, which can evolve potentially along countless open-ended vectors depending upon the outcomes sought, the emergent behaviours encountered, and the extent to which both are transformed in the mangle of practice. Whereas every aspect of the conceptual and machinic frameworks that specify, sustain, and constrain the experimental process can be transformed in the real time of practice, the digital literary texts listed in the *ELC* are designed to permit only a certain number of prescribed operations that do not destabilise the system or go beyond the limitations established by a prior intersection of authorial intent with an existing technical matrix. Such bounded stability ensures that no matter how vast and intricate the expressive outputs of a given text, these will be always materially finite in scope, and so will exhibit common attributes across many specific iterations.

The permanently pre-disciplined spaces of digital literary texts can appear to undermine significantly comparisons with Pickering's performative vision of science and technology, in which machinic captures of material agency are subject often to substantive change over the course of their involvement with human frameworks and goals. However, Pickering is careful to stress that scientific and engineering practices do not emerge from within a social, cultural, or technical vacuum. Arguing that 'existing culture predisciplines the extended temporality of human intentionality', he notes that 'the field of existing machines serves as a surface of emergence for the goals of scientific practice', and so argues that 'human intentions are bound up and intertwined (in many ways) with prior captures of material agency in the reciprocal tuning of machines and disciplined human performances' (*The Mangle* 20). These prior captures do not serve merely as the point of departure for scientists and engineers, but provide a matrix through which the emergent transformations of the mangle of practice can be understood, assessed, and then acted upon. Thus, whenever scientists and

engineers work to reshape the world, the transformations resulting are mediated as much by the technical and cultural properties of their surrounding environment as by the particular steps constituting the dances of agency through which they have emerged.

The experience of actualising digital literature is no different in this regard, in that its enabling technologies are the product of existing cultural norms and technical practices. These conventions provide subsequently a key frame of reference through which the performative encounter with the text can be assessed and then responded to by the reader. In this sense, the pre-disciplining of the performance, and the lack of ultimate mutability on the part of specific texts, can be understood as constituting another form of concrete and conceptual resistance affecting the reader of digital literature, rather than an obstruction that prevents or invalidates the dance of agency. Indeed, it is this inability to adjust the system freely that forces a negotiated stance to emerge between the two, and so enact the dialectic of resistance and accommodation that characterises the mangle of practice. Moreover, it is this engagement with a pre-disciplined environment that enables digital literary texts to explore through their performances the structural attributes of these technologies, hidden otherwise behind pristine graphical interfaces or naturalised by convention, and so highlight the technical and cultural assumptions underpinning these formations before evaluating them in light of different narrative, thematic, or semantic concerns.

To offer a brief illustration of this capacity, two of the works listed in the *ELC* are room based installations that track the reader's bodily movements in order to effect changes in the scriptural forms they project onto adjacent walls. The first is *Still Standing* (2005) by Bruno Nadeau and Jason Lewis, in which the reader is required to stay motionless whilst a body of letters, lying initially at the bottom of the main screen, gathers itself around her silhouette into a poem that meditates on various tropes of movement and stillness—collapsing the moment she walks away (see fig. 14, page 66). The second text is *Screen* (2003) by Noah Wadrip-Fruin et al., which harnesses a Cave Automatic Virtual Environment (CAVE) to immerse the reader within a three-dimensional scriptural milieu—one that explores human memory as an unstable, virtual phenomenon—and which responds in various ways to her bodily gestures—such as by allowing her to pick up and relocate the words that appear to surround her, or by combining them to form various neologisms (see fig. 15, page 66).

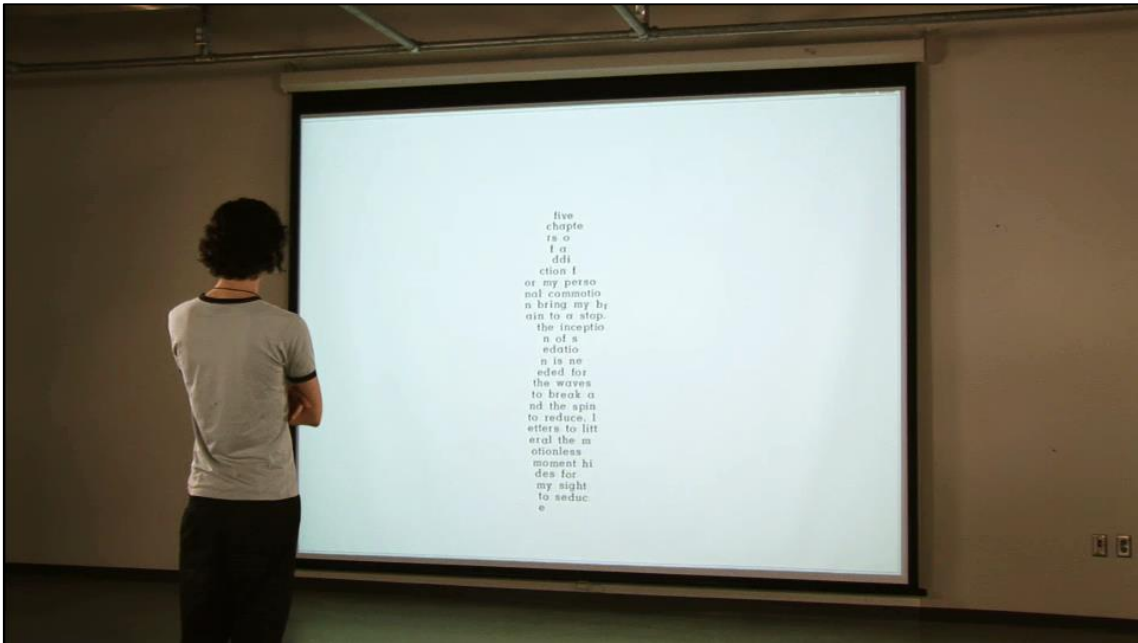


Fig. 14. Screenshot from an *ELC* video of *Still Standing*.



Fig. 15. Screenshot from an *ELC* video of *Screen*.

When compared to the other texts of the *ELC*, the most striking feature of these installations is their eschewal of commonplace keyboard and cursor interface paradigms in favour of gestural recognition—although, as a

consequence, they can be experienced only through video recordings by readers lacking access to the original installations. When understood in this context, the reader's engagement with these texts is notable precisely because of its contrast with the constraints underpinning desktop derived interface paradigms, in which all interactions are mediated through a small number of tightly disciplined input and output channels—and so eliding much of the varied spectrum of bodily engagements and cues that underpin human interactions with the observable world. Nevertheless, at the very moment this comparison is established, the reader will find her actions, and the outputs resulting, subject to equal levels of constraint—in the case of *Still Standing*, by having to remain motionless, or, for *Screen*, by considering how her ability to effect changes in the virtual environment pale when compared to what her bodily gestures could achieve potentially outside of its bounds.

These varied contrasts are illustrative of how the functional powers of digital technology are rooted in its capacities of selective abstraction, with specific sensory cues being translated into electronically parsable sequences that can be either stored or synthesised prior to their re-articulation through specific hardware emitters—allowing for arbitrary assemblages of sensory experience to be generated for specific purposes, such as in producing virtual environments or simulated office desktops, but which can lack consequently the open-ended richness of the material world beyond the confines of the computer. In this sense, by enacting an alternative to orthodox keyboard and cursor interface architectures, and so highlighting implicitly their selective restrictions, *Still Standing* and *Screen* provide a space for questioning the assumptions structuring the arrangement and operation of all digital interface systems—the tasks they were designed for, and the logics underpinning them. Such understandings can feed subsequently into a political assessment of the practices behind all digital literary texts: the degree to which they engage, rework, or challenge extant technocultural orthodoxies as part of their performative engagements with the reader, and whether this amounts to a form of progressive practice that can offer an insight into the contemporary intersection of eventfulness, creativity, and technology—an evaluative trajectory that will be considered in greater detail in the next section of this chapter, and investigated throughout the remaining chapters of this thesis.

It is in light of these remarks concerning the role of digital literature in exploring the underlying structures of digital systems, the technical and cultural assumptions guiding their development and deployment, and their subsequent impact on the wider techocultural landscape, that a final point of contention can be addressed concerning the applicability of a performative standpoint for examining digital literary texts that preclude the reader from entering any concrete inputs of her own, other than to furnish the actions necessary to access them. In the opening chapter it was noted that across both volumes of the *ELC* are numerous works of digital literature that are conveyed using a linear video format, relaying their outputs sequentially in real time—texts such as *Code Movie 1* by Giselle Beiguelman and Helga Stein, and *Urbanalities* by babel and escha. It was observed subsequently that some texts, such as *_cross.o.v.a.i.n.g 4r.m.blog.2.log 07/08 xxtracts_* by the artist 'Mez', are entirely static, presenting a finite body of outputs that can be traversed at will by the reader. Initially, the experience of actualising these texts can appear inimical to being depicted as a dance of agency in the sense that Pickering describes, for the reader is denied the opportunity to make substantial adjustments so as to guide the unfolding of the text. Nevertheless, these scenarios do not preclude her from responding in ways that can be accounted for usefully from a performative standpoint.

In the case of video texts, where the output sequences cannot be navigated freely, the reader is confronted by a machinic agency whose behaviours she can understand and evaluate only by observing its varied manifestations in real time. Conversely, as a tightly pre-disciplined artefact, the reader can rely on its capacity to reiterate the same core sequences every time it is set into motion, with each viewing helping to elucidate those aspects that are either unfolding concurrently or are subject to degrees of change with each passing iteration—*Urbanalities* being one such instance, with its scriptural outputs being generated anew each time. It is this resistance to being observed and known holistically, and the conceptual transformations that can occur after every viewing, that establishes a dialectical encounter with the reader akin to Pickering's dance of agency, albeit in a more delimited sense. Furthermore, as observed previously, in treating the digital literary text as a constraining agent in the performative encounter, a space is created for considering the structural attributes of the technologies through which these resistances manifest—in the case of *Code Movie 1*, the encoding structures by which digital images and animations are expressed, or in the case

of *Urbanalities*, the generative algorithms underpinning the iterative variations it presents.

Static texts such as *_cross.ova.ing* present a significantly greater challenge to this kind of performative interpretation, for in these instances any sense of animated resistance to the reader's agency is almost absent. A limited response would be to accept either a breakdown of the comparison, or to treat the text in question as an outlier—with the inclusion of *_cross.ova.ing* in the *ELC* being justified through its use of language derived from various tropes of software programming, rather than through any technical integration with the digital medium in ways that go beyond the storage and display characteristics of the printed codex.

Whilst it is unavoidable that Pickering's understanding of the dance of agency is of only limited use for describing how the reader may come to engage such texts in real time, it can offer still a path for considering the author's role in bringing it into being. *_cross.ova.ing* is the product of a creative exposition of the software architecture underpinning the contemporary technocultural environment—which brings in turn the material agency of electronic signals to a level that can be parsed and engaged more readily by human operators, and so is coextensive with them. Whilst software languages may be developed expressly in response to the demands of particular end applications and the efficient use of computing resources, *_cross.ova.ing* represents a redeployment of these language tropes in order to consider the larger question of how the complexities of the observable world are rendered perceivable and actionable to computers that operate using exacting digital abstractions.

Such creative interventions, assuming they did not erupt into being within the space of a single act, can be understood as emerging through a dance of agency, in the sense that the artist has had to explore and rework various pre-disciplined software tropes in relation to her own interests over time, evaluating different possibilities of dialogue as these emerged, before settling on a combination that appeared to articulate satisfactorily the intersection of different technical and cultural issues—a process the reader enacts subsequently in her own consideration of the relations between the language, the technology, and the thematic concerns present. Although this represents a more conceptual manifestation of the dance of agency, it remains one that is grounded within, and shaped by, the matrix of material structures and practices that constitute modern

software architecture and the greater technocultural domain from which it emerges. It is in this sense that static texts such as *_cross.ova.ing* can be understood as expressing the greater performances underpinning the genesis and deployment of contemporary digital systems, illustrating concurrently another mode of creative practice through which these systems can be engaged and restructured for this end—offering a space for considering what these practices, in their different manifestations, might represent as a form of contemporary knowledge-making.

2.3. Enacting the Nonmodern

2.3.1. Adaptation

The above account of the performative exchange between the reader and the text in the digital literary encounter establishes the basic parameters in which a comparison with the material performances underpinning scientific knowledge-making can be sustained. The principal question arising subsequently concerns the critical and the political value of this comparison in the first instance—of what understanding digital literature in light of the performative idiom and the mangle of practice can reveal concerning the emergent vectors of modern technoculture, and how these might be approached creatively and critically.

The beginnings of an answer can be found in Pickering's contention that the 'constitutive intertwining and reciprocal interdefinition of human and material agency' can be viewed as subverting 'the black-and-white distinctions of humanism/antihumanism' by moving 'into a *posthumanist* space, a space in which the human actors are still there but now inextricably entangled with the nonhuman, no longer at the center of the action and calling the shots' (*The Mangle* 26). It is this posthumanist vision that Pickering unpacks further in his book *The Cybernetic Brain: Sketches of Another Future* (2010), which considers the broader implications of the mangle of practice for acts of knowing and being—of the kinds of knowledge-making activities that can emerge if these implications are acknowledged and then acted upon. Pickering's investigation here is of value to this discussion in that it defines a number of concepts that can be used to articulate the political potential of the digital literary performance: exploring how the contemporary technocultural environment might be approached, evaluated,

and transformed in creative and critical practice, before describing how the reader can conceptualise her own engagements with digital literary texts in light of these vectors.

As suggested by its title, *The Cybernetic Brain* concentrates upon the history of cybernetics, a branch of scientific theory and practice that was defined initially by the mathematician Norbert Wiener in *Cybernetics: Control and Communication in the Animal and the Machine* (1948). This key text laid the foundation for a new scientific discipline that focuses on adaptive systems and the manner in which they perceive and respond to changes in their surrounding environment. Significantly, as per the subtitle of Wiener's book, the cybernetic worldview does not privilege the adaptive processes of living entities over and above the operations of machinic formations, which are considered equally as having to engage with a dynamic, unpredictable world by reacting and adapting in a performative exchange of agency.

In considering the conceptual flattening of human and nonhuman agency prevalent within cybernetic thought, Pickering invokes Bruno Latour's argument concerning the relations between the natural and social worlds in *We Have Never Been Modern* (1991), describing cybernetics as presenting a nonmodern ontological vision, 'in which people and things are not so different after all' (18). Following Latour, Pickering defines the paradigm of modernity as 'coextensive with a certain *dualism* of people and things', and contends this worldview has long been instantiated within the rigid categories of Western knowledge—as evidenced by the continuing academic gulf between the natural and social sciences (18). Drawing again from Latour, Pickering considers this institutionalised ontology to be a key tenet of the 'modern' scientific attitude—a category which correlates broadly with his earlier description of the representational idiom, in which the world is divided into strict human and nonhuman domains, with the relations between them expressed solely in terms of different structures of representation:

The modern sciences invite us to imagine that our relation to the world is basically a cognitive one—we act in the world through our knowledge of it—and that, conversely, the world is just such a place that can be known through the methods and in the idiom of the modern sciences. One could say that the modern sciences stage for us a modern ontology of the world

as a knowable and representable place. And, at the same time, the product of the modern sciences, scientific knowledge itself, enforces this vision. Theoretical physics tells us about the unvarying properties of hidden entities like quarks or strings and is silent about the performances of scientists, instruments, and nature from which such representations emerge. [...] [T]he performative aspects of our being are unrepresentable in the idiom of the modern sciences. (19-20)

Representational knowledge in this passage is concomitant with a vision of control: of a world that can be known fully, its unfolding predicted in advance, and its agency arrested through technology and put into the service of human needs. In contrast to this view, Pickering understands the science of cybernetics to be nonmodern in multiple ways. At first, the very need for a science of adaptive systems suggests that far from being the ontologically static, readily predictable formation of the modern sciences, the observable universe is an unpredictably emergent domain, whose unfolding contingencies can never be anticipated fully or precluded entirely through the application of abstract knowledge, and so must be tackled in the real time of practice. The adaptive systems outlined in cybernetic theory can be understood subsequently as a performative expression of knowing and being—with representational knowledge being insufficient to account for the world's becoming—and it is in this light that Pickering, echoing the ontological premise of the mangle of practice, concludes that 'cybernetics stages for us a vision not of a world characterized by graspable causes, but rather of one in which reality is always "in the making," to borrow a phrase from [the philosopher] William James' (19).

In highlighting the inadequacies of representational knowledge for mapping and describing the world, the cybernetic paradigm suggests concurrently that it is not even a necessary precondition of the practices through which contingent material behaviours can be responded to successfully. Adaptive systems, regardless of whether they are living or machinic, have to tackle novel behaviours in their surrounding environment as these emerge in real time, and their ability to cope, despite a lack of conceptual knowledge regarding the particular causes or processes behind such phenomena, is indicative of how material performances constitute in themselves a vital aspect of everyday being, as Pickering illustrates in the passage below:

[The] hallmark of cybernetics was a refusal of the detour through knowledge—or, to put it another way, a conviction that in important instances such a detour would be mistaken, unnecessary, or impossible in principle. The stance of cybernetics was a concern with performance as *performance*, not as a pale shadow of representation. [...] One could, for example, imagine a highly sophisticated thermostat that integrated sensor readings to form a representation of the thermal environment and then transmitted instructions to the heating system based upon computational transformations of that representation [...] But my thermostat at home does no such thing. It simply reacts directly and performatively to its own ambient temperature, turning the heat down if the temperature goes up and vice versa. (21)

Such material performances are echoed in the physiochemical processes that keep the bodies of living entities in a homeostatic equilibrium with their surrounding environment—adjusting automatically myriad organic parameters in response to changes whose properties are only perceived in terms of their immediate physical effects upon the body itself, rather than through any representational mapping of their core attributes.

Pickering draws a number of conclusions regarding the principal implications of the nonmodern aspects of cybernetic thought and practice as they relate towards the material performances underpinning scientific knowledge-making. Initially, he characterises the cybernetic understanding of the world as being predicated upon a ‘black box’ metaphysics, and describes it thus:

A Black Box is something that *does something*, that one does something to, and that does something back—a partner in, as I would say, a dance of agency [...] Knowledge of its workings, on the other hand, is not intrinsic to the conception of a Black Box—it is something that may (or may not) grow out of our performative experience of the box. (20)

A modern scientific attitude treats black boxes as a challenge to be overcome, articulating ‘a determination to strip away their casings and to understand their inner workings in a representational fashion [...] to make this or that Black Box (or class of Black Boxes) transparent to our understanding’ (20).

By contrast, the nonmodern matrix of cybernetic theory characterises the unpredictable becomings of the world as exceeding the descriptive capacities of atemporal figures, and so remaining unknowable from the standpoint of the representational idiom. Consequently, the cybernetic approach towards these black box systems is to focus not on gaining specific conceptual knowledge of their innermost workings—though such understandings may emerge in practice eventually—but on participating in their material operations so as to discover what possibilities of expression they may facilitate. Cybernetic projects, in accepting the premise of an emergent environment that can never be known fully, are thus, in Pickering's schema, creative and exploratory in nature, engaging experimentally with the present state of the world in order to discover how it may perform: 'a continuing interaction with materials, human and nonhuman, to explore what might be achieved' (32).

As a vivid instance of this type of project, Pickering cites the 'Musicolour' machine of psychologist Gordon Pask. This electronic device used musical input to control a dynamic light show, seeking to create an audio-visual synthesis. Significantly, it was designed in such a way that not only did it account for the varying frequency and tempo of these musical inputs when sequencing different light emissions, but it adjusted gradually its internal parameters in response to evolving patterns in the performance:

In analogy to biological neurons, banks of lights would only be activated if the output from the relevant filter exceeded a certain threshold value, and these thresholds varied in time as charges built up on capacitors according to the development of the performance and the prior behavior of the machine. [...] If the same musical trope was repeated too often, the thresholds for the corresponding lighting pattern would eventually shift upward and the machine would cease to respond, encouraging the performer to try something new. Eventually some sort of dynamic equilibrium might be reached in which the shifting patterns of the musical performance and the changing parameters of the machine combined to achieve synesthetic effects. (316-7)

In Musicolour, Pickering observes a nonmodern object that stages not only the adaptive entanglement of human and machine in the real time of practice, but

also the emergent forms of knowledge-making that are enacted through this exchange—with the synesthetic balance between musician and machine being established in the performance itself, rather than conforming to a predefined trajectory (319-20).

Pickering designates artefacts such as Musicolour to be a manifestation of what he labels 'ontological theatre', for their adaptive mechanisms articulate both a 'vision of the world as a place of continuing, interlinked performances'—modelling the processes through which human and nonhuman agencies perceive and negotiate their surroundings—and provide 'instances of the sort of endeavors that might go with a nonmodern imagining of the world' (21-2). Here, ontological theatre is an expression of a nonmodern approach towards the material world and its capacities for change, jettisoning the modern desire to map, predict, and arrest its agency for particular ends, and instead working to explore and to foster its different possibilities of becoming. This is a form of performative knowledge-making that goes beyond Pickering's original conception of the mangle of practice, for whereas the latter operates in service of specific aims and applications—irrespective of the extent to which these are reworked in practice—instances of ontological theatre are the product of a worldview concerned with emergence—taking the potential of the world as a starting point, and then engaging creatively with its becoming so as to crystallise this potential into different forms, which themselves have the capacity to take on other forms beyond their initial shape. Described succinctly, this is an open ended treatment of a world that is itself open ended in its becoming.

2.3.2. Exploration

Pickering's understanding of nonmodern ontological theatre provides a useful means of expressing the progressive value of treating digital literature as an expression of performative knowledge-making. At a basic level, expanding on earlier comparisons with the mangle of practice, digital literature offers an instance of both the processes and the products of a creative, nonmodern approach towards the world. The transient nature of the expressive outputs generated by many digital literary texts—shifting and transforming in ever surprising ways, and driven by the reciprocal, adaptive entanglement of human and machine—means their key attributes can be parsed more readily through the

material processes of their unfolding in real time, rather than as a map of an already extant textual domain. From this standpoint, these artefacts can be read as illustrating the nonmodern premise of a world that is inexhaustibly emergent, yielding novel vectors of configuration that can never be encapsulated fully within any single act of creation or understanding, but must be engaged and explored repeatedly in order to articulate its capacities of becoming.

Taking this understanding further, digital literature becomes an example of the kinds of objects and practices that can emerge when this nonmodern stance, even if not perceived explicitly as such, is acted upon. Initially, digital literary artefacts come into being through the experimental transformation of an existing technical matrix, and so bear out the creative intersection of human and machinic agencies in crystallising the possibilities inherent within this infrastructure—discovering and developing novel uses for technologies that may have been designed with very different use cases in mind. By fostering in turn an exploratory dialectic with the reader, these texts can enable subsequently the emergence of novel output sequences that may go far beyond what their authors thought possible with the system they developed. That is, whilst these outputs will manifest by necessity along prescribed channels, they are frequently open ended in the potential number of sequences and configurations they can exhibit, depending on how the system and the reader respond to one another in real time—a point made by author Emily Short when analysing her own work *Galatea*:

What I wanted to do was give the player the impression that the universe was completely open-ended, and that, rather than fumbling among a large number of options to find the one that I had chosen to implement, he could meaningfully do just about anything and get some kind of result. Obviously, it wasn't possible to achieve that: all the possible endings in *Galatea* are [...] things that I wrote because I anticipated some combination of events that would make them appropriate. But there are 30 or 40 such endings [...] and many hundreds of ways to reach them. So as a story machine, the game is effective at creating scenarios that I haven't specifically thought about. [...] Even knowing all the endings does not mean knowing all the different ways to reach them, all the possible spins they can carry in different contexts. ("Multilinear IF")

In presenting an emergent, unpredictable matrix of expressive possibility, digital literature can aid the nonmodern imagination by highlighting not only the myriad human-material couplings that play a crucial role in actualising and sustaining contemporary digital computing, but demonstrating also the emergent practices that can arise if these performances are valued in their own terms, rather than being marginalised or foreclosed under the aegis of the modern, goal oriented worldview. Digital literary texts can thus take on the status of minor interventions that enact a type of creative knowledge-making that intersects, reveals, and reworks the structures and processes of contemporary digital technoculture, evaluating and actualising its potentialities through practice.

This global perspective on the political dimensions of digital literature carries a number of implications for understanding both the material performances and the scriptural outputs manifested by specific texts, which then serve as the pathway through which this broad, nonmodern stance is crystallised into particular instances of creative intervention—revealing the assumptions structuring the contemporary digital environment whilst demonstrating how these can be transformed. It is in elucidating these implications that will constitute the key goal of the close readings in the remaining chapters of this thesis. However, prior to conducting these detailed investigations, it is useful to consider what the nonmodern worldview can suggest concerning how the critical reader should frame her own engagements with digital literary texts as part of the process of articulating their expressive capacities.

As observed in chapter one, a key challenge presented by digital literature for any critical reading is the fact that many of its constituent texts evolve and change in line with the reader's engagements in real time, which ensures frequently that no two reading trajectories are alike. Lacking the stable points of reference through which to evidence her analysis, the critic has to make explicit her choices when actualising the performative encounter, and, by extension, the provisionality of her final reading. This approach can run counter to expectations of critical distance that might be implicit in the reading of other forms of creative expression—in which the mappings produced can be evaluated against all the salient features of the work in question, and their correspondence tested subsequently by other critics. From a nonmodern standpoint, however, these partial, provisional readings of digital literature are apposite to the evolving, ever changing environment of which they are both part. In his description of the

metaphysics expressed by cybernetic artefacts and other instances of ontological theatre, Pickering contends that a nonmodern reading of the world as a 'black box' treats it as an emergent agential environment whose potential counters of action and expression are perceivable only through their actualisation in the real time of practice. In documenting the research strategies adopted by early cybernetic practitioners when confronting these kinds of emergent behaviours, Pickering observes that rather than delineating the phenomena under investigation as being separate from the practices used to investigate them—and thus, amenable to description through representation, with such representations providing the source for a testable hypothesis to emerge—the nonmodern approach of the cyberneticians accepted the experimental process as an investigatory end in itself:

The cybernetician does not know the appropriate terms—the language, the relevant conditions—for describing his or her object in advance; they have to be discovered in interaction with that object. Further, we know we have found suitable terms (not a true description) when we use them to construct a model of the object which enables us to understand its behavior when subject to additional interferences. Cybernetic interference produces new languages in which to address and interrogate its object. (*The Cybernetic Brain* 344-5)

As Pickering contends here, to approach the world as a performance in the fullest sense is to facilitate its possibilities of expression, with the conceptual knowledge gained being subordinated to this task, and thus articulated through the performative exchange between different agents, rather than standing apart from them. In rejecting the notion of a Cartesian universe that can be understood from afar, a nonmodern critical attitude operates on the premise that human engagements with the world are predicated not upon its description in the abstract—whether emerging through hypothesis or folded back into theory—but on reshaping it in the real time of practice so as to explore what can be achieved. This open ended heuristic renders the search for singular descriptions of observable phenomena as but one form of engagement, accepting a view in which a multiplicity of approaches and outcomes are possible—signaling the

different capacities of the world's becoming, rather than a failure of the experimental process.

The task of investigating critically digital literature, as a form of nonmodern theatre, can offer a space for acting on this attitude, for just as the reader has to discover new conceptual formations in order to explore and then explain her emergent engagements with the text, so too does the critic, and the provisionality of the readings generated apply to both equally. The fact these perspectives may become incommensurable at points is no barrier for a nonmodern reading of the digital literary encounter, for it accepts these divergent behaviours as articulating some of the many ways a given text can unfold in practice. This openly experimental approach towards the performances of digital literature can elide thus the difficulties posed by trying to delineate their essential qualities in the face of constant change by favouring an exploration of how they can manifest in real time—to unearth the conditions of possibility for their becoming, the processes through which they can yield new output forms, and so evaluate the insights and alternatives they might present concerning the perspectives and practices shaping the technocultural domains from which they have emerged and are engaged.

A note of pragmatism may be raised at this point to reengage a critique noted earlier in the discussion, in that when compared to the emergent richness of a nonmodern world, a work of digital literature, though part of this domain, remains nonetheless a constructed, bounded artefact, whose capacities of becoming are determined largely by a delimited array of software structures and processes. From this standpoint, the 'black box' perspective presumed by nonmodern accounts of physical behaviour, though appropriate to a world whose emergence exceeds the descriptive and predictive power of representational abstractions, can elide potentially how digital literature is expressed through mechanisms whose functioning graphs into a finite, stratified, and logically tractable schema of operations. In short, the apparatus of all digital literary texts are knowable, even if the specific output sequences they yield are context dependent, and so to concentrate on their surface dynamics risks omitting these underlying architectures and losing sight of their conceptual implications.

One response can be found in the work of media theorist Noah Wardrip-Fruin, who has sought to read the significance of these structures as manifestations of particular ways of knowing and being in the world:

I use the term expressive processing to talk about what processes express in their design—which may not be visible to audiences. Just as when opening the back of a watch from the 1970s one might see a distinctive Swiss mechanism or Japanese quartz assembly, so the shapes of computational processes are distinctive—and connected to histories, economies, and schools of thought. Further, because digital media’s processes engage subjects more complex than timekeeping (such as human language and motivation), they can be seen as “operationalized” models of these subjects, expressing a position through their shapes and workings. Processes, when examined, may also express a very different set of priorities or capabilities than one might assume from authorial or scholarly descriptions of the system. (*Expressive Processing* 4-5)

As an example of these kinds of ‘operational logics’, as he calls them later, Wardrip-Fruin cites the pioneering story generation program *Tale-Spin* (1976) by James Meehan. This program assembled short stories using a sophisticated array of processes that, with the aid of a few user prompts, constructed a virtual environment inhabited by reasoning character-agents—the various tales emerging out of their goal-oriented interactions with this environment and with one another. Wardrip-Fruin notes how this configuration reflected a particular conception of Artificial Intelligence (AI) predominant in the 1970s, which sought to model human cognition on the assumption that it could be emulated through the development and execution of plans—a perspective rooted in a rationalistic vision of purposeful action grounded in abstract representation, a longstanding trope of Western thought that has since been unseated within cognitive research (150).

In seeking to characterise how a reader of digital media relates to these otherwise hidden architectures, Wardrip-Fruin notes three distinct levels of observation and understanding: 1) instances where the expressive surfaces of digital media appear more complex than what is supported by their underlying software 2) instances where the latter is indeed highly sophisticated, but whose complexity is neither reflected by, nor deducible from, the surfaces it enables 3) instances in which the surface experience is structured so that the reader can assemble gradually a complex understanding of these internal structures (15-6).

Though lacking the forensic specificity of Kirschenbaum, Wardrip-Fruin's approach highlights how it is predominantly through the surfaces they sustain that a reader comes to know, with varying degrees of fidelity, the technical structures of digital multimedia, whilst acknowledging still how these structures express culturally contingent logics that may not be perceivable necessarily through such interactions.

In the terms outlined by Wardrip-Fruin's schema, some works of digital literature are predicated explicitly on fostering, and challenging, the reader's sense of their underlying functioning. *Bad Machine* is a particularly vivid instance in this regard, with its emulation of a machine oriented environment. Another work that plays actively with different levels of reader understanding is *exquisite_code* (2008/9) by Brendan Howell and Sabrina Small. In his analysis of this work, and the various live writing performances of which it formed part, the critic Mark Marino describes it as a digital adaptation of the surrealist technique 'exquisite corpse', in which a cycle of authors react to one another's creativity in sequence—circulating and extending a piece of writing by having access only to the contributions made by the author preceding (284). In *exquisite_code*, however, this process is modified by having an author's written extracts amended and distributed by various algorithmic rulesets, whose specific operations are hidden from view. Marino notes that these 'imperfect' informational and spatial transformations of the writing—termed 'munging' by Howell—fostered amongst the participating authors a mode of 'reading as reverse engineering', seeking to game the system so that their written contributions would be more likely to survive intact in the final written document—that is, they were encouraged to develop an empirical knowledge of the algorithmic rulesets they were facing, seeking to exploit or to counteract their effects (292, 294, 301).

Although works such as *Bad Machine* and *exquisite_code* thrive on establishing different relational modalities between the reader and their constituent software, most of the cases present within the *ELC*, though engaging often with themes foundational to digital computing, make no express attempt at exposing or exploring their inner workings. Moreover, although Wardrip-Fruin's own analyses is founded largely on having direct access to the source code underlying his chosen examples—vital in order to gauge the reader's empirical understanding—the works of the *ELC* are devoid of this information as listed

currently, raising the numerous logistical and ethical challenges involved in decompiling these artefacts so as to gain an insight into their functioning.

The point of approaching texts missing this information as ‘black boxes’, under the critical aegis of performativity, is not to elide or ignore their status as software artefacts entirely, but to acknowledge, as does Wardrip-Fruin, their positioning as but one component of the aesthetic encounters in which they are experienced and understood primarily. Although the forensic level of insight sought by critics such as Kirschenbaum is unlikely to be achieved as a consequence, an empirical understanding, as it varies from instance to instance, remains of value from a nonmodern standpoint precisely because it emerges and is made meaningful through experimental practice. In other words, digital literature can be treated as fostering a mode of thinking through software that undermines the modern imperative of seeing how a text fulfils particular aspects of its programming and highlights instead the contexts and practices in which it operates—to treat software as an agent amongst many, rather than an all-determining force, and thus liable to be understood and engaged from a variety of contingent perspectives in the frequent absence of exacting knowledge of its operations. It is within these environments that the becoming of a text is made possible, despite its ultimate finitude, and thus, more broadly, for it to become demonstrative of what a nonmodern mode of reading the world resembles in practice.

Before applying the conceptual frameworks outlined in this chapter to the task of reading specific digital literary texts, one final issue remains to be considered regarding the status of the scriptural outputs they generate. Whilst a nonmodern attitude is capable of addressing the material dance of agency between the reader and the text as a source of meaningful expression in its own right, there is a need to consider whether this can be extended usefully towards the representational outputs resulting from these exchanges. Stated alternately, a question arises as to whether the scriptural aspects of digital literature, emerging through the intersection of human and machine, are to be viewed separately, or are understood better through the material dynamics of this performative exchange—which then becomes the principal space in which the significance of a digital literary work arises.

In order to explore this question, and so consider more fully the critical efficacy of Pickering’s work for a performative understanding of digital literature,

this discussion will now enter into a dialogue with the work of the literary critic Jerome McGann, whose early research, documented in *Radiant Textuality* tackles a similar problematic concerning the relationship between materiality and meaning as it plays out across the dynamic spaces of printed literary artefacts.

2.4. Deforming the Digital Text

2.4.1. Form

McGann's collection of essays in *Radiant Textuality* provide an extended account of his pioneering efforts to establish the critical efficacy of computational tools as a means through which to assist literary scholars in the task of evaluating textual materials. Writing the preface to this collection in 2001, McGann explains his motivation by arguing that the 'general field of humanities education and scholarship will not take the use of digital technology seriously until one demonstrates how its tools improve the ways we explore and explain aesthetic works—until, that is, they expand our interpretational procedures' (xi-xii).

Despite the recent eruption of productive critical work in the modern field of digital humanities research, McGann's collected writings remain valuable for their tackling of perennially important questions regarding the relationship between linguistic meaning and digital machines. Whereas, McGann observes, 'this textual condition of ours is constructed as a play of incommensurable elements', digital systems 'are designed to negotiate disambiguated, fully commensurable signifying structures', and this divergence leads to the question of whether these machines can 'be made to operate in a world that functions through such ambiguities and incommensurables?' (xiii-xiv) In other words, McGann enquires as to how the fluidity of textual meaning can be tackled by digital technologies whose underlying mechanisms are predicated upon a highly stratified and logically tractable schema of operations.

In seeking to answer this question, and so develop computational techniques that can help elucidate the full richness and complexity of textual artefacts, McGann offers an account of the relations between meaning and the materiality of the medium through which it is conveyed—an account whose efficacy lies not in specifying an essential dynamic characterising this relationship, but in expressing the capacities of textual criticism to articulate its

myriad potentialities. McGann's vision is of significance to this discussion in that it considers textual artefacts to be active participants in the literary encounter, shaping the paths through which its scriptural forms are accessed by the reader, and so influencing the contexts in which they are received and interpreted—a conception of materiality that echoes Pickering's own delineation of the agency exhibited by material artefacts in their engagements with human beings, and their role in shaping the kinds of knowledge yielded subsequently. McGann himself considers the potential for this understanding of textual phenomena to relate to purely digital forms, and it is by developing his ideas that the basis for a performative critical understanding of the scriptural outputs of digital literature can be established.

The key principle behind McGann's critical approach is that textual phenomena can be perceived as meaningful only in relation to the material circumstances required for their articulation. Instead of conveying atomised units of inherited meaning, McGann understands text to be a generative phenomenon that is performed within the space of a dynamical interpretive field—the space of the negotiation between the reader and the textual medium (150). The basis of this attitude can be found in McGann's contention that 'Linguistic units are not self-identical [and] don't even occupy fixed positions within a given textual space [...] since a variety of overlapping and incommensurable planes transact all textual spaces. Textual space and textual time are n-dimensional simply because they locate embodied actions and events' (xiii).

Reiterated in simpler terms, McGann states here that any textual space can be thought of as an n-dimensional field that unfolds along the temporal axis of reading in myriad possible ways—rather than being confined along the trajectory of a pre-established world line, or existing as a singular plane that can be perceived in its entirety. McGann argues subsequently that the meanings expressed by linguistic units—whether they are word-objects, sentence-objects, or narrative-thematic matrices—are governed by the particular spatial and temporal contexts in which they are enacted. An individual word-object, for instance, can articulate a range of potential signification depending upon its immediate local context—such as whether it is perceived in isolation or embedded within a greater linguistic formation—as well as the overarching reading sequence of which it forms part.

When taken in this light, McGann's reference to 'embodied actions and events' can be understood as referencing the fact that whilst every linguistic unit can be shaped potentially by any part of the textual space in which it is perceived as being situated, the reader can only ever actualise a very limited number of these potentialities depending upon her particular trajectory through the textual medium (xiii). That is, the medium, as a material formation, has the effect of localising the reader's traversal of the textual field, for the logistical impossibility of actualising concurrently its every aspect ensures that only a limited interpretive window—a spatiotemporally relative perspective—can be generated and sustained at any one time. The spatiotemporal axes of each individual reading arc will have therefore a very particular influence upon both the meanings realised for the linguistic units they encompass and the global textual 'state' that emerges subsequently. Every interpretive trajectory represents thus only one of many possible material-discursive pathways that can be actualised by the reader:

Every text is a network of roads taken and not taken. Some of the roads have never been taken, so far as we know, and of the roads known to have been taken, some are well travelled and some hardly travelled at all. [...] Roads identical in one respect or another may be seen as very different roads if viewed from a different vantage—and of those different points of view, many will be possible. (152)

McGann reiterates the above standpoint in a slightly different sense by arguing that to interpret a literary work is to constrain its myriad possibilities for meaning: 'because text is a field of dynamically unfolding elements and relations, every "state" of a text represents an arbitrary form "taken out of The Form," [...] These forms are de-forms and their usefulness for textual analysis lies exactly in the set of differential possibilities they call to attention' (152). Every critical interpretation of a text represents thus an arbitrary 'state' derived from the overall field of semantic possibility afforded by a given textual space—a provisional arrestment of the text's potential that highlights, as a consequence, its many possible alternatives.

The primary import of these selective deformations of the textual field for critical knowledge-making are evaluated in an essay McGann co-wrote with the poet Lisa Samuels, "Deformance and Interpretation", which is reproduced within

Radiant Textuality. McGann and Samuels start their discussion by defining critical knowledge-making as the ‘application of scientia to poiesis, or the effort to elucidate one discourse form in terms of another’ (127). They observe subsequently that when textual scholars seek to interpret a literary work ‘the usual object of interpretation is “meaning,” or some set of ideas that can be cast in thematic form’, and that consequently ‘an essential relation is preserved between an artistic work and some structure of ideas, that is, some conceptual form that gets more or less fully articulated *for* the work. To understand a work of art, interpreters try to close with a structure of thought that represents its essential idea(s)’ (106). Acknowledging the dynamism and instability of meaning as it is actualised across innumerable textual planes, McGann and Samuels adopt a different approach towards the problem of textual criticism, one that makes no pretence of reading the textual space from afar—seeking to uncover the essential meanings encoded within—but that attempts ‘to break beyond conceptual analysis into the kinds of knowledge involved in performative operations—a practice of everyday imaginative life’ (106).

The basis of McGann and Samuels approach is that rather than asking what a given text means, as if a singular answer awaits discovery, they enquire as to how the critical reader can realise or expose its possibilities for meaning (108). Inspired by the poet Emily Dickinson’s claim that to recite a poem in reverse, to disorder its apparent arrangements on the page, yields novel and productive readings—de-familiarising the text and encouraging its constituent words and their relations to be appraised anew—McGann and Samuels develop a methodology for reconstituting the structures exhibited by literary and poetic artefacts in order to generate novel critical perspectives. They select the term ‘deformance’ for this approach so as to emphasise not simply its mode of operation, but to point at a critical shift away from a hermeneutic focus on the text itself and towards the greater social arena of textual knowledge-making—performing interventions that are calibrated towards the production of novel critical readings, both in terms of the investigatory process and its outcomes, rather than establishing a canonical body of textual attributes.

In demonstrating their approach, McGann and Samuels apply a selection of deformative techniques onto Wallace Stevens’ poem *The Snow Man* (1921): reordering its textual structures on the page, reading only its constituent verbs, and substituting different combinations of words for others. For McGann and

Samuels, the principal value of this approach is its capacity for surprise: 'When we run the deformative program through a particular work we cannot predict the results. [We] are brought to a critical position in which we can imagine things about the text that we didn't and perhaps couldn't otherwise know' (116). Therefore, in relation to the question of meaning, they argue:

Our deformations do not flee from the question, or the generation, of "meaning." [...] Rather, they try to demonstrate [...] that "meaning" in imaginative work is a secondary phenomenon, a kind of metadata [...] This point of view explains why, in our deformative manoeuvres, interpretive lines of thought spin out of some initial nondiscursive "experiment" with the primary materials. "Meaning" is important not as explanation but as residue. It is what is left behind after the experiment has been run. We develop it not to explain the poem but to judge the effectiveness of the experiment we undertook. (129)

From this standpoint, the goal of literary analysis is not the production of specific accounts relating to particular works, but the process of investigation itself—of articulating different strategies for enacting a text so as to realise its potential for expressive becoming. McGann and Samuels connect this argument with the work of the literary critic Galvano della Volp, who contended that an interpretation of a literary or poetic work does not represent an account of its essential meaning, as if this was an inherent property of the text, but functions instead as a record of the particular analytical procedures through which it has been investigated—and so acting as a catalyst for future readings by providing a framework through which the developmental possibilities and limits of a particular perspective can be made apparent:

An interpretation so-called makes a record of a particular act of critical reflection and analysis. This record is at the same time an algorithm for generating further reflection and analysis, starting with the record itself. In this respect the record is less clearly understood as a meaning or even a form than as a program, in the computational sense of the term. (102)

Therefore, with every act of textual criticism being deformative in its operations, documenting the manoeuvres through which the text in question is configured and constrained so as to produce a particular array of meanings, the explicitly deformative approach of McGann and Samuels takes this state of affairs one step further by reshaping its material attributes, creating unusual configurations that, when compared and contrasted with others, can generate hitherto unimagined insights into its expressive possibilities, and so catalysing further novel vectors of analysis and interpretation.

McGann and Samuels acknowledge that deformative criticism represents a significant departure from more traditional critical work, which does not 'commonly locate hermeneutic vitality in the documentary features of literary works' (115). Nevertheless, they argue it has the benefit of reinvestigating the terms by which critical commentaries are undertaken, revealing how there can be many possible approaches towards the task of textual criticism by demonstrating that 'concept-based interpretation, reading along thematic lines, is itself best understood as a particular type of performative and rhetorical operation' (106). It is in this regard that they extol also the deformative 'exposure of subjectivity as a live and highly informative option of interpretive commentary, if not indeed one of its essential features, however neglected in neoclassical models of criticism that search imaginative works for their "objective" and general qualities' (116).

2.4.2. Meaning

McGann and Samuels' deformative critical efforts were oriented primarily towards exploring how computational tools can be employed best to facilitate the interpretational modes of literary scholars. Nevertheless, in a later essay concerning the structural properties of textual forms, *Rethinking Textuality*, McGann presents an undeveloped but suggestive application of these ideas in relation to digital reading environments that are employed not for the task of analysing text but for generating literary and poetic encounters—that is, works of digital literature.

In considering the difference between the reading experiences afforded by digital and documentary formats, McGann contends that computer technologies can support textual phenomena that possess two reciprocal attributes that are not emulated readily by traditional 'docutexts': a 'higher order' reading

environment, 'where the user's interaction is no longer a readerly one', and the ability to simulate in real time an n-dimensional textual field (158). Stated in simpler terms, the digital medium can support literary artefacts that do not have to be interpreted as permitting a multiplicity of semantic configurations, but can articulate this potential through their structural reconfiguration in real time. That is, the reader's interrogation of the textual field can involve adjusting not only the conceptual frameworks through which it is viewed—in the manner of conventional documentary literature—but to participate in its material unfolding in real time, and so reconfigure the contexts in which specific output forms are received and understood. When taken in light of the deformative critical enterprise, these material reconfigurations of the textual field can be understood as being productive of novel critical interpretations in a manner akin to digital manipulations of documentary literature—the key difference being that performative digital texts incorporate and articulate these deformative techniques at a structural level, reconfiguring themselves in real time as part of how they are actualised and experienced, whereas a documentary text must be processed by a separate, higher order reading environment.

It is this observation that provides a path through which McGann and Samuels' work can be placed into dialogue with that of Pickering, and so demonstrate how a performative stance is applicable to the task of interpreting both the material behaviours and the scriptural outputs expressed by digital literary texts. At a basic level, a number of important conceptual resonances can be noted between McGann's understanding of textual phenomena and the nonmodern stance as delineated by Pickering. A first point of comparison can be found in their shared emphasis upon the performative intersection of human agencies and material structures in actualising and sustaining material and textual phenomena—which are not treated as *a priori* formations with a set of unchanging attributes but as emergent vectors of the world's becoming. McGann and Pickering highlight subsequently the role of material resistances in determining the shape of these engagements, with the apparatuses of scientific research and the architecture of the textual medium working to constrain the intentional structures of human agency. Moreover, both theorists observe that these resistances have an important and productive function within the processes of knowledge-making. In the case of Pickering's nonmodern stance, the unpredictable becomings of the material domain provide the motivation for

escaping the constraints of the modern sciences and the representational idiom in favour of an open ended, forward looking search for new possibilities—to move beyond the subordination of the world to the demands of abstract hypothesis, and to engage instead with the potentialities enacted through the experimental process itself, to see where it might lead. In the case of McGann and Samuels' work on deforming the structural attributes of documentary literature, the act of reshaping the material characteristics of the text does not represent a disruption or distortion of its observable attributes, but functions to actualise and exteriorise hitherto unknown perspectives and catalyse further interpretive vectors concerning them—with the investigatory process itself being the priority of critical practice.

These parallels demonstrate a number of the key ways in which materiality and meaning are entangled reciprocally in the generation of scientific and textual knowledge. Pickering's scientists and engineers have to discover in the real time of practice the critical vocabularies through which they can conceptualise the material performances they inaugurate, whilst McGann's critic has to traverse and actualise selectively the textual spaces she encounters in order to discover and articulate the semantic possibilities they afford. Moreover, such material and conceptual engagements are not conducted from within a cultural or semantic vacuum, for just as the existing field of machines and scientific theory forms the surface of emergence for the human intentions structuring Pickering's dances of agency, previous acts of critical analysis and interpretation provide the catalyst for the new interpretive procedures that McGann and Samuels find productive.

It is in light of these parallels between the work of Pickering and McGann that the question of meaning in relation to a performative analysis of digital literature can be engaged, for it suggests how the scriptural outputs generated by a given text cannot be perceived and understood in abstract isolation, but as emerging and transforming in line with the dances of agency through which they are yielded. From this standpoint, the meanings that emerge through the digital literary encounter are grounded in the circumstances through which it is actualised in practice—providing the principal context of reception through which its specific output forms can be perceived and evaluated. Any changes in this performance have not only therefore a significant impact on the output sequences that are realised over the course of the encounter between the reader and the text, but also shape the meanings that are crystallised as part of them. This

implies in turn that a fully performative conception of digital literature involves treating its literary attributes through the lens of the material practices through which these are made visible, rather than as a separate aspect.

The question of reader affectivity—that is, the ‘pleasure of the text’—is not elided here, but is instead an integral component of the means through which digital texts become semantically in the real time of the aesthetic encounter. Although the performative account outlined above does not seek to pre-empt the reader’s understandings and reactions to the particular behaviours and outputs of specific texts, in seeking to capture the exploratory heuristic through which she engages the dynamism of digital literature, it is reliant crucially on her wish to respond adaptively—driven by various emerging questions, desires, or imperatives—to a literary form that is articulated visibly in the flow of practice—as a becoming, rather than as a static formation that, once examined, can be contemplated in the abstract. Generative digital texts such as *White-Faced Bromeliads on 20 Hectares* (1999) by Loss Pequeño Glazier represent instances where this reliance is key in the absence of complex interactive possibilities. Described in the author’s introduction as ‘a poetic evocation of the images, vocabulary, and sights of Costa Rica’s language and natural ecosystems’, *White-Faced Bromeliads* presents eight poetic stanzas that regenerate on a line by line basis every ten seconds—and thus, if read conventionally, ensures the reader never finishes the same poem that she began. On this point, Glazier emphasises that the reader should take her time with the work, reading its lines aloud, and allowing the initial images it presents of the Costa Rican landscape to cycle through before beginning. Unable to influence significantly how the poem emerges, beyond directing her attention to the different stanzas and contemplating each one in turn, the reader is presented with a space in which a definitive reading of the unfolding performance, in all its myriad variations, is impossible in practice, but is invited instead to evaluate the expressive combinations that she finds most appealing in real time—that is, to take pleasure in the poem’s very transience, and to see the perpetual mixing of words, phrases, and images as its chief aesthetic effect. Indeed, this rapid cycling and recycling of scriptural outputs lies at the heart of virtually all the texts listed in the *ELC*, and the reader’s desire to engage with the flow, to crystallise its semantic potential before seeing it redrawn as a consequence of material agencies beyond her own, is an affective modality characteristic of the digital literary encounter.

This entanglement of materiality, meaning, and reader affect provides a neat instance of the conclusions shaping Pickering's work in both *The Mangle of Practice* and *The Cybernetic Brain*, demonstrating the way in which the act of knowledge-making is made possible through practical engagements with the continually productive becomings of a material agential environment—with knowledge itself existing not exclusively in the form of conceptual abstractions, but as being articulated and sustained through concrete acts of material expression in real time. It is this deep connection between the materiality of the digital medium, the performances that it enables, and the possibilities of meaning they can realise, which permits a fully performative approach towards the analysis and interpretation of digital literature to become possible—and it is how such an approach can function in practice that will constitute the principal focus of the remaining chapters of this thesis.

3. Engagements: A Performative Analysis in Action

This third chapter presents an initial reading of specific digital literary texts from a performative critical standpoint, demonstrating the results yielded when the conceptual frameworks outlined in chapter two are deployed to describe their formal and semantic characteristics. For this end, the discussion examines Dan Waber and Jason Pimble's *I, You, We* (2005), and *Roulette* (2008) by Daniel Howe and Bebe Molina—two texts that provide a number of avenues for considering the critical and political implications of reading digital literature as a performative entanglement of human and machinic agency.

Both analyses of *I, You, We* and *Roulette* are divided into three subsections that are arranged in accordance with the trajectories exhibited by their unfolding over time. The first section 'Form' outlines those attributes that become apparent on initial examination: their interface mechanisms, functional characteristics, and primary output sequences. The second section 'Content' specifies how the reader's interpretative agency is affected by these formal attributes over the course of the performative exchange, as well as how the semantic properties of these texts are crystallised into particular configurations as the scriptural field is transformed. The final section 'Practice' expands these observations to encompass the greater thematic vectors expressed by the textual performance—what the particular concerns of these texts reveal concerning the status of digital literature as an art form, and as a potential instance of nonmodern thought and practice.

In the wake of these opening analyses, this chapter considers a different trajectory of thought by acknowledging the way in which the technical properties of digital literary texts can seem to work against a performative analysis—initiating a debate concerning whether the emergent behaviours exhibited can be reconciled with the status of digital artefacts as machines whose functioning is predicated on tightly delimited structures. In considering these conceptual challenges, the discussion will highlight the work of Martin Rosenberg and Stuart Moulthrop, who enacted an early form of this debate regarding the politics of hypertext. It is in reviewing the lessons provided by the work of these two authors that the chapter concludes by arguing that a nonmodern reading of digital literature can accommodate the resistances presented by its varying technical properties by establishing the mechanical and the emergent as being reciprocally

constitutive of one another, forming a dynamic in which structure and emergence are bound together in the performative enactment of both the text and the world.

3.1. *I, You, We*

3.1.1. Form

Dan Waber and Jason Pimble's *I, You, We* was presented first to a reading audience in 2005 as part of an exhibition at Harvard University entitled 'Infinity: an exhibition of visual poetry and artwork built on/from/around words and letters'. Although the website accompanying this exhibition is no longer available, *I, You, We* remains accessible as a result of its inclusion within the first volume of the *ELC*. The introduction accompanying this piece on its entry page reads as follows:

A simple lattice, a limited palette of colors, and a nudge of its own movement let the words of *I, You, We* resonate. The piece is visually pleasing and also quite readable: choose a word and a direction and start going. Waber and Pimble's verbs are six-dimensional, plotted on the X, Y, and Z axes, but also on the axes of *I, You, and We*.

On the same page is another description offered by the authors themselves:

The viewer is inside a kind of cube, an infinite cube that can be rotated endlessly without returning to the same view. Between *I* and you and we flows a river of verbs. The piece can be manipulated by clicking or dragging, or will move on its own if left still for a few moments.

Both of these statements offer a succinct outline of a text whose ostensive minimalism exhibits all the more clearly the performative dynamics that characterise digital literature as an art form. Moreover, in lacking any explicit narrative or thematic vectors, this text can be seen to mediate self-reflexively on its core attributes and expressive potential, both as a specific artefact and as an instance of a larger genre. It is these mutually reinforcing characteristics that make this text a suitable initial candidate with which to demonstrate a performative analysis in action. The opening view presented to the reader upon loading *I, You, We* in her web browser is shown in fig. 16 (see page 96).



Fig. 16. The opening view presented to the reader of *I, You, We*.

At the centre of the screen is a capitalised ‘I’ surrounded by an array of words that radiate outwards in every direction—enveloping the reader’s immediate visual field and stretching out towards an imperceptible horizon. Studied more closely, it becomes apparent that these words are arranged into several cubical lattices that are nested inside one another, thus forming a three-dimensional scriptural matrix. This arrangement is accentuated through the positioning of the other two key pronouns constituting the title of Waber and Pimble’s text, ‘you’ and ‘we’, which are plotted repeatedly along the X, Y, and Z spatial axes so as to outline the perimeters of two separate cubes. These features are immersed in a field of verbs that are arranged into further cubical lattices—being nested between and around those formed by ‘you’ and ‘we’, as well as surrounding the ‘I’ at the absolute centre. These verbs encompass an extremely broad array of actions, occurrences, and states of being, and are generated randomly each time the text is loaded afresh.

The three-dimensional architecture of *I, You, We* becomes all the more apparent whenever the reader selects an arbitrary location on the screen with her cursor and proceeds to drag the scriptural matrix around its absolute centre. Although the reader is denied the ability to realign this matrix so as to offset its centre of rotation, adjusting its orientation in space around a fixed point has the

phenomena as an n-dimensional field. As described in chapter two, McGann envisioned linguistic units as occupying a multitude of semantically charged positions depending on their varying spatial and temporal contexts of reception within the reading encounter—these being crystallised and reconfigured by the reader's traversals of the text in real time, or, as McGann puts it, 'deformed', constrained into a particular form out of myriad potentialities. *I, You, We* presents a visual depiction of this model via the open lattice structures of the text, requiring the reader to make explicit choices regarding the sequences of words she may wish to follow, but maintaining also the presence of latent alternatives to these choices through the varying proximity of different word gatherings. Furthermore, the deformative process of realising these different possibilities is expressed through the transformation of the scriptural field along the X, Y, and Z spatial axes as it rotates, yielding new graphical and linguistic constellations with each passing moment, and so animating its deformation in real time—emphasising the impact of the reader's selected trajectory in actualising the potential of the text, facilitating some of its possibilities whilst foreclosing others.

As McGann notes, the benefit of acknowledging the deformative processes of reading for the task of critical knowledge-making is that it shifts the interpretative paradigm away from establishing the meaning of a text, and towards one that seeks to realise or expose its potential for meaning. This critical stance emphasises the experimental, open-ended engagement of a text to explore its capacities of becoming. Just as the architecture of the medium is a necessary predicate of the deformative literary encounter—constraining the logistics of the reader's actualisation of the text along particular lines—it is crucial equally for acts of criticism that are deformative explicitly in their operation—conducting specific material interventions into the structures of the text, rearranging and substituting words and their contexts, in order to yield surprising productions that can help elucidate, through comparison, the channels through which its expressive potential is made manifest. In the case of *I, You, We* such interventions are integral to its actualisation, generating new scriptural configurations in real time, and so yielding access to new routes through which these different possibilities of reading and interpretation might emerge.

It is at this point that a deformative understanding of *I, You, We* can unfold into a performative depiction along the lines suggested by Pickering, with the medium functioning as a resistant, yet productive agent in the digital literary

encounter. In animating the processes of deformation, the text articulates how the emergence of new interpretative pathways are predicated on challenging the reader's extant perspectives and understandings of the scriptural field and her location within it—resisting, effectively, her efforts at comprehension by transforming in ways that disrupt, foreclose, or reorient her interpretative trajectory. It is these resistances, coupled with the actions taken by the reader subsequently in order to overcome or exploit the patterns of the text's becoming, that drive an emergent dialectic between them, and so manifest Pickering's foundational concept of the 'dance of agency', in which the act of knowledge-making becomes a performative negotiation between human and machinic agencies, rather than a hierarchical imposition of human thought and endeavour over a passive, nonhuman domain. This reciprocal exchange between the reader and the text can be taken as expressing subsequently the basis of the nonmodern paradigm that Pickering delineates in *The Cybernetic Brain*, in which the modern dualism between human and nonhuman activity is broken down and replaced with a dynamic in which both are recognised as agential forces when entangled within the space of a performative encounter, whether in the context of science, engineering, or art.

3.1.3. Practice

In thinking through the performative intersection of human and nonhuman agency that underpins the reading encounter with *I, You, We*, the scriptural outputs generated through these exchanges can be understood in turn as bearing out Pickering and McGann's complementary notions of how representation and meaning are not expressions of *a priori* structures inherent within the fabric of observable reality, but are created and sustained through different material practices that enact the world in specific ways. By evaluating its particular entangling of the material and the conceptual, the digital and the scriptural, *I, You, We* can be read as meditating on the role of these activities in actualising different conditions of perception, action, and expression in a computationally driven environment. This reading invites a consideration of the extent to which this text serves as an instance of progressive, nonmodern practice—as presenting an emergent vision of knowledge that is oriented towards exploring and facilitating the world's potential, rather than delimiting it in accordance with absolute rules.

To contextualise this understanding, it can be reiterated how Pickering's discussion in *The Mangle of Practice* depicts the performative and representational aspects of science and engineering as being entangled by necessity, with scientific concepts being specified and upheld through machinic captures of particular material performances. In *The Cybernetic Brain*, Pickering observes that cybernetic practitioners went further by arguing that material practices constitute the very conditions of possibility for new concepts and languages to emerge—with many observable phenomena exhibiting behavioural capacities that are open-ended in their operations and outcomes, and so rendering science an adaptive process, assembling knowledge in real time as it develops strategies for engaging and guiding these behaviours, rather than prefiguring them in the abstract.

As noted in chapter two, McGann's account of the interpretation of textual phenomena resonates with both these depictions of human knowledge-making, arguing that instead of conveying atomised units of absolute meaning:

Text generates text, it is a code of signals elaborating itself within decisive frames of reference. A text is a display and a record of itself, a fulfilment of its own instructions. Every subsequent re-presentation in whatever form—editorial or interpretive—ramifies the output of the instructional inheritance. Texts are like fractal derivations. (*Radiant Textuality* 151)

Here, McGann contends that a text can stand only as an unrealised abstraction outside of the specific practices in which it is actualised and interpreted, whether scholarly or readerly in orientation, and it is these which crystallise and diversify the range of outputs that can be supported by the material structures constituting the textual artefact. Stated alternately, the conceptual vectors expressed by a given text—its narrative, thematic, and semantic attributes—come into being only when it is enacted within the context of different interpretative manoeuvres, rather than existing as static, *a priori* structures awaiting discovery. These manoeuvres consist in negotiating both the observable features of the textual artefact itself—sequencing them into different combinations and juxtapositions, highlighting potential networks of relations across the scriptural field—and the extant bodies of understanding surrounding the text and their upholding practices—against which the novelty and value of any critical intervention is evaluated.

This resistive intersection of the medial structures of the text, the practices through which it is viewed and sequenced, and the greater interpretative field in which both are enacted, constitutes the environment in which textual knowledge-making, the enactment and upholding of meaning, becomes possible. As noted by McGann subsequently, the configurative flexibility of digital texts can help visualise these interpretative procedures more overtly than their printed counterparts, for their formal attributes can be reconfigured at scales and speeds that far exceed the technical capacities of the latter. That is, their structures are able to evolve and change in response to the reader's heuristic input, and so can animate the processes delimiting their expressive agency as it is realised in the real time of practice. In highlighting what McGann characterises as the deformative function of all critical reading practices, digital textual manipulation, whether native to the work in question or applied subsequently, also helps broaden the focus of inquiry to include the dynamic social and cultural fields in which it takes place—encouraging the ramification of the 'instructional inheritance' of the text in line with an array of intersecting or divergent critical imperatives, as opposed to specifying atemporal readings that transcend the emergences of time and place.

It is in this light that the relationship between the key pronouns constituting *I, You, We* and the matrix of verbs in which they are entangled can be approached as a meditation on how the emergent properties of all textual phenomena are affected by their articulation through the digital medium—as a recursive depiction of how the latter shapes not only the unfolding of the reading encounter, but also the greater interpretative environment in which a text is enacted and understood.

To explicate this point further, it is possible to outline briefly an alternative reading in which the pronouns of 'I', 'you', and 'we' are perceived in abstract isolation. Here, they can be depicted as offering straightforward points of entry into the scriptural field, given their material persistence within it, before assisting in the construction of different linguistic trajectories through this space: '*I* enthuse, *you* ascertain, *we* untangle', for example. The 'I' in particular, situated at the absolute centre of the scriptural field, marks thus the root of the reader's own relationship with the text as a stable point of origin, entry, and influence—demarcating the axis through which her agency in the literary encounter is made manifest. This perspective can render the lattices of verbs constituting the bulk of Waber and Pimble's text as indicating only the different states of being that might

be attributed to the subjects implied by 'I', 'you', and 'we'—graphing the various manifestations of human agency in the world, as it is perceived and made intelligible from the reader's own sense of being. Consequently, the digital medium, as a marker of the nonhuman domain, is reduced to a transparent window into the virtual environment—a neutral framing of the reader's actions and perspectives, rather than a source of agency through which these can be resisted and reoriented.

By contrast, in accepting the digital medium as an agential source within the space of a performative literary encounter, this narrow understanding of its scriptural outputs breaks down and is replaced by a series of more complex effects. One initial consequence is that the agential and semantic emphasis shifts away from the 'I' at the absolute centre, as an indicator of the reader's control over the text, and disperses outwards into the scriptural field and the technical structures through which it is sustained. The dialectical exchange between the reader and the textual artefact becomes thus a key frame of reference through which the outputs generated are rendered meaningful, undermining subsequently any sense of the pronouns 'I', 'you', and 'we' as providing transcendent points of reference and understanding. In other words, it is the material processes articulating the text in the first instance that are shown to crystallise its semantic attributes, evolving and changing as the reading encounter develops, rather than the linguistic units yielded exhibiting an independent agency of meaning.

As noted previously, *I, You, We* draws attention to the practices of literary interpretation by articulating a scriptural field that visualises the emergent effects of these manoeuvres in real time. This visualisation, going beyond that which could be sustained or emulated by print technology, functions self-reflexively to illustrate the agency of digital systems in enacting specific textual interventions—whether independently or in channelling the reader's behaviour—which are productive of an array of emergent, unpredictable effects. The most notable such effect in *I, You, We* is the populating of the scriptural field with randomly selected verbs, both at the beginning of the reading encounter and whenever a particular verbal node returns into view after departing, thus rendering it impossible to establish the same scriptural configuration twice. The reader is confronted by a textual environment that escapes the bounds of her agential influence over its becoming, and is thus made aware of the transience and provisionality of her interpretative outlook—only able to grasp the text within a delimited frame of

reference in space and time, as it is structured by her engagements with agential forces that she can never predict entirely. Consequently, the scriptural outputs of *I, You, We* become oriented less around defined narratives of understanding, and constitute instead a sequence of liminal marks delineating the agential capacities of the reader and the text at a particular moment in time—of their co-constitutive entanglement within the space of the digital literary encounter, defining reciprocally their capacities of action and expression in real time.

By observing the semantic transformations undergone by these sequences in response to their changing contexts of actualisation and reception, a correspondence can be drawn with Pickering's overarching contention that human knowledge-making is never a crude imposition of power over an unresponsive environment, but is constituted instead through its material engagements with a nonhuman domain—one that resists and restructures human agency as part of the process by which it attempts to shape and comprehend the world. The wider scriptural field, in providing a space for the realisation of an expansive array of linguistic possibilities, becomes thus an expression of the innumerable potentialities of the world as a performative agential environment—one that is characterised not by a fixed array of material capacities and causal possibilities, but whose continual unfolding manifests in many different and surprising forms. It is in this way that the semantic reconfiguration of *I, You, We* as a textual environment can be understood as emerging from, and articulating further, an adaptive, dialectical state of being that is characteristic of the performative idiom more generally. Going further, these emergent vectors can be depicted as necessitating in turn the reader's adoption of a nonmodern critical attitude in her explorations, for in demonstrating that her knowledge of the text is always provisional, never absolute, the reader must confront the ways in which her framing of the encounter—its starting conditions, interstitial dialogues, and concluding vectors—become established through her interactions with the system, rather than being prefigured in the abstract. Consequently, she is encouraged to search not for a definitive understanding of the text, but to explore its unfolding in practice, and so construct a framing that allows her to describe usefully the different vectors of the encounter as they emerge. This heuristic process is open ended for *I, You, We*, but may conclude once the reader has found a means of articulating her exchanges with the text that satisfy certain problematics arising from them—whether this is to understand

the mechanical functioning of the interface, to pursue a semantically interesting pathway through the scriptural field, or to gain a limited sense of the vocabulary it supports. Although this provides only a limited instance of the experimental, open ended vectors of nonmodern practice, it nevertheless enacts with the reader an alternative mode of knowledge-making that is illustrative of the potential for digital literature to explore and crystallise progressive ways of engaging and understanding digital systems.

3.2. *Roulette*

3.2.1. Form

Daniel Howe and Bebe Molina's *Roulette* was published initially in the Spring 2008 issue of the online *New River Journal*—known currently as *The New River*—and can be found also in the second volume of the *ELC*. This piece is comparable to Waber and Pimble's *I, You, We* on a number of points, but it diverges also in ways that yield alternative insights into the relations between digital literature, performativity, and nonmodern thought and practice.

The initial view presented to the reader upon loading *Roulette* in her browser is depicted in fig. 18 (see page 105). The screen is dominated by three transparent cubes that rotate continually about their various axes. Inside these cubes are an array of smaller cubes, inscribed each with a single word, and which rebound chaotically off one another in response to the rotation of their surroundings. Below these structures is a short paragraph of writing, exhibiting both narrative and poetic qualities, which is generated anew each time the text is reloaded.

In order to interact with this text, the reader is required to click on each of the main cubes with her cursor, which has the effect of selecting arbitrarily one of the smaller cubes inside them. So long as the reader holds down the index button, the selected cube proceeds to expand in size until it fills entirely the transparent walls of its originating primary cube. This in turn allows the inscription it carries to be magnified sufficiently as to be legible. Clicking on this cube subsequently has the effect of returning both cubes to their original state.

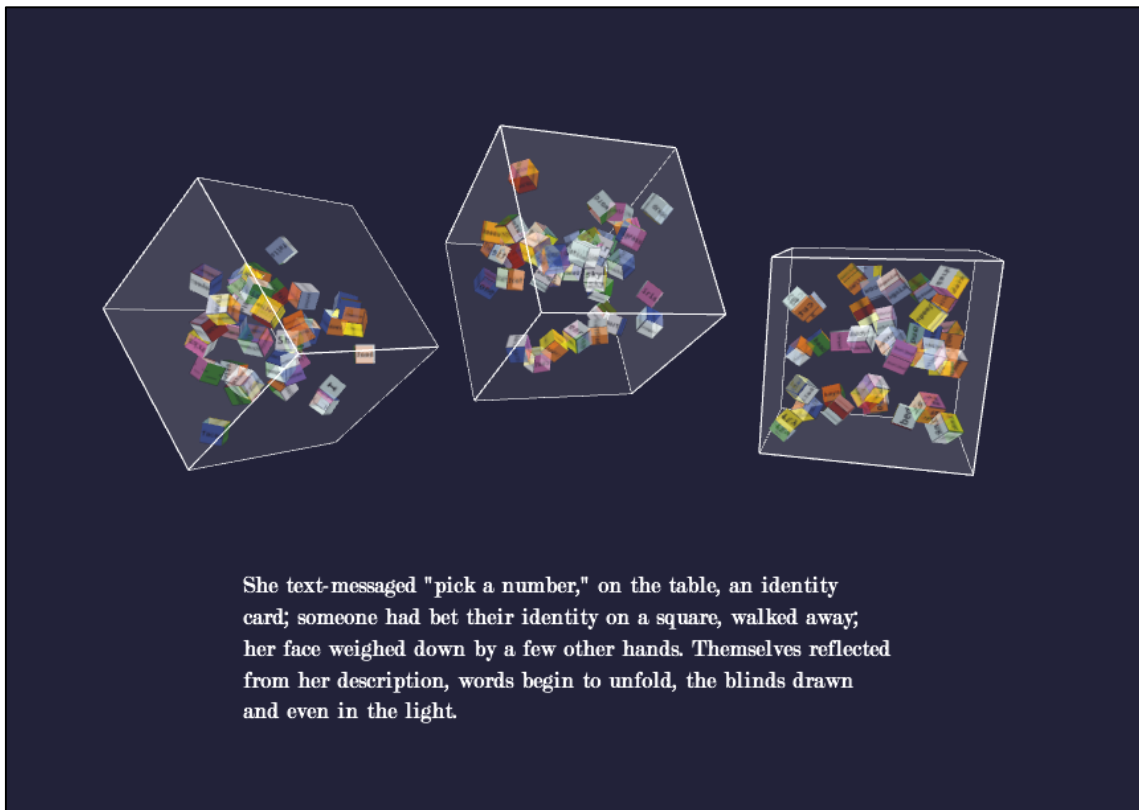


Fig. 18. An opening view of *Roulette*.

The act of highlighting different cubes, and their associated inscriptions, forms the mechanism through which the reader can alter the paragraph of writing that is located below them. Each new selection results in this paragraph being reconfigured so as to incorporate the new word, which is highlighted in red (see fig. 19, page 106). Additionally, the system is structured so that, to varying extents, these new additions are integrated so as to be correct grammatically and appropriate contextually—that is, embedded within predefined sentence structures that can be sequenced in relation to those either side of them. The reader is afforded thus a limited ability to adjust her selections in order to generate different scriptural configurations and sequences, introducing up to three new additions at a time.

The final outputs that emerge from this process are enigmatic, but recurrent phrases invoke themes of chance and possibility as it enables and unsettles different framing acts of perception, inscription, and understanding in an age of computer mediated communication. When read in light of the performative imperatives guiding this analysis, these outputs are suggestive of the instability and richness of a world that exceeds frequently the grasp of human knowledge

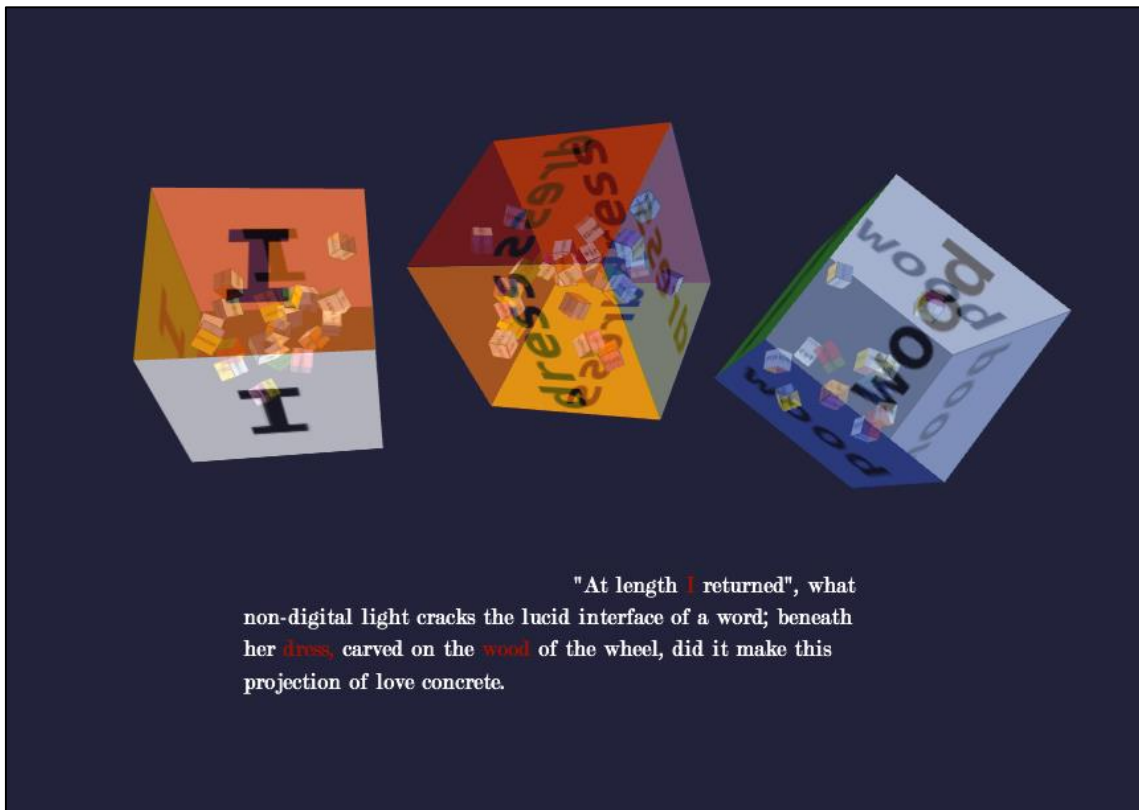


Fig. 19. A typical view of *Roulette* once the reader starts interacting with the text.

making, and of representational accounts in particular, but which provides concurrently the very means through which new perspectives and understandings become possible—the reader's efforts at interpreting the outcomes of chance enacting this key point, linking the words and phrases together not in accordance with reconstructing a predefined authorial schema, but drawing resonances between them of her own making. Some example outputs are presented below, with the reader selected words highlighted in red, as they appear on the screen:

Is there one, coherent you: break the image apart, in reverse, the ball landing where it came; the previous fall and the one behind it, a thought moving in several directions.

On **paper**, air folded; pigeons flapping text-messages at **one** another in mid-flight, from birth, do all the voice-mails **return**?

Through the **room**, what non-digital light cracks the lucid interface of a word; beneath her **dress**, the exterior **body** following an interior language.

At the seams of her **retina**, doubly, a movement of losses gaining definition, empties itself back into a hole of nothing, or a thumb and index **finger** making the air round, the interior word contains a mute sky, intonation aligns at every **edge**.

Such are the emergent properties of these outputs that they are suggestive less of a coherent narrative or poetic environment than a mechanism in which the reader can evaluate the conditions of the text's unfolding, her own responses to this, and what the resulting performance might signify concerning the greater technocultural environment in which it occurs. In short, they act as a means of exploring the capacity of digital systems and their human operators to negotiate the myriad vectors of the world's becoming, and to inscribe it with meaning.

3.2.2. Content

To explore the above point further, the structural layout of *Roulette*, as with *I, You, We*, can be read as echoing McGann's conception of textual phenomena as an n-dimensional field, visualising this through a similar arrangement of rotating cubical structures—the Brownian motion of their scriptural contents suggesting the multiplicity of positions, configurations, and relations they occupy concurrently. However, unlike Waber and Pimble's text, in which the rotation of this field is concomitant with the reader's own trajectory through it—articulating a sense of how this space becomes deformed, constrained, and thus actualised by the reading encounter—*Roulette* presents a more detached perspective, with the reader looking on as the text unfolds according to its own encoded imperatives—her inputs acting as cues for the system to yield its own word selections as part of the next iteration of the performance. Consequently, the reader is forced to confront the limits of her ability to direct the open-ended potential suggested by the textual field. Although she is able perceive the space of vocabulary afforded to her, as it is demarcated by the transparent cubes, the reader has no power to choose with precision the scriptural outputs she can actualise at any given moment, with the effects of her inputs being subject entirely to chance, as befits the work's title.

At one level, this apparent lack of influence echoes further McGann's depiction of the basic ontological condition of all textual phenomena prior to their

actualisation in practice—of their status as unstable, n-dimensional entities until crystallised through the processes of reading. This view is not inappropriate to the core thematic content of *Roulette*, meditating on the potentialities of chance as a precondition of the practices through which perception and understanding, interpretation and meaning, emerge and are ramified. Nevertheless, when *Roulette* is approached more broadly as a performative digital artefact, another understanding emerges in which the reader's perspective is situated so as to evaluate the text less in terms of how textual phenomena are enacted and transformed within the digital milieu, as is the case primarily with *I, You, We*, but to focus instead on how her interactions with the system constitute a meditation on the transformation of human intent by nonhuman imperatives.

As an opening into this more expansive understanding of the digital literary encounter, as it is enacted by *Roulette*, it can be noted that if the reader wishes to go beyond facilitating arbitrary combinations of words and sentences within this text, she can pursue a strategy of changing only one or two of her previous selections so as to produce different iterations of the current paragraph. An example of this is shown below, with the first and third selected keywords, 'light' and 'unfold', being retained, whilst the second keyword is replaced with a new selection each time:

Light, as a word, refracts into misunderstanding, break the image apart, words begin to unfold, the blinds drawn and even in the light.

Light, as a word, refracts into misunderstanding, a blankness emerged, shaping the red, making it turn to roses, begin to unfold, the blinds drawn and even in the light.

Light, as a word, refracts into misunderstanding, the wheel without numbers. Some threw their bets from across the room, none of which landed; remained in suspension, the air is in odds with itself, words begin to unfold, the blinds drawn and even in the light.

In combining iteratively the database of scriptural primitives that constitutes *Roulette*, the reader delimits its myriad potentialities by following a sequence of simple, repeated instructions. Like all digital artefacts, the functional structures of

Roulette are governed also by fixed operations that work upon a specific array of variables in real time: a procedural arrangement known as an algorithm. It is in this manner that the text must calculate arbitrary responses to the reader's inputs, and the only way the reader is able to counteract this is by enacting a similarly delimited routine, channelling the unpredictability of the text into sufficiently narrow paths that a certain degree of control can be exerted. Initially, this delimited dance of agency between the reader and the text bears out Pickering's observation concerning the parallels between human and machinic agency, with the former echoing the latter in having to conform to its operational requirements, which are a necessary predicate of the practices in which both come together. Going further, however, this tightly entangled scenario, in contrast to one in which the reader adopts a more expansive approach towards the textual performance, is suggestive more broadly of the interplay between the modern and nonmodern ways of engaging the world's becoming.

3.2.3. Practice

The very title of *Roulette* frames the contingency of the observable world as being the principal context in which its becoming as both a digital and a textual artefact can be understood. As discussed in chapter two, Pickering has outlined two distinct ways in which these emergent dynamics can be approached within the context of knowledge-making, based upon contrasting framings of the relationship between the human and the nonhuman domains.

The first stance is to follow the imperatives of the modern worldview, and the representational idiom that gives rise to it, and define the world outside of human thought and action as a passive and altogether predictable domain—one that can be described fully within a rigid conceptual matrix, which then becomes the main driver of human agency and the goal structure to which the nonhuman material world is made to conform. In his introduction to an essay collection he co-edited with sociologist Keith Guzik, *The Mangle in Practice* (2008), Pickering draws from the work of philosopher Martin Heidegger to characterise this dualistic approach as an 'enframing' of the world, in which "we humans seek to step outside nature, dominating and controlling it, challenging it forth as "standing reserve" for circuits of production and consumption" (5). Pickering illustrates this stance by comparing the late work of the artist Piet Mondrian and the

longstanding efforts of the U.S. Army Corps of Engineers to contain the Mississippi river. In Mondrian's geometrical abstracts, Pickering sees a controlled, coordinated vision of the world that is developed and delineated in the abstract, prior to being imposed onto the blank canvas of an awaiting material environment. In the case of the Army Corps of Engineers, Pickering recounts their multimillion dollar, cross-decadal efforts at directing the flow of the Mississippi in accordance with the demands of human habitation, industry, and commerce, contending that whilst such actions may indeed be deemed necessary, they are predicated nonetheless on the forcible enframing of the world in accordance with a delimited schema of thought and practice, as opposed to adapting to the tremendous agential forces at work. In both these examples, across art and engineering, Pickering identifies a pattern of human agency seeking to contain the nonhuman within an envelope of abstraction.

Standing in contrast to this view is the nonmodern approach, and the performative idiom from which it emerges. Here, the nonhuman environment is acknowledged to be an active, emergent formation, whose agency often resists, refuses, and exceeds the ability of any one body of forces to arrest and direct its unfolding along particular vectors. Human thought and agency is part of this milieu, and so rather than functioning in the abstract, it must work in conjunction with an array of competing forces in order to achieve and sustain particular formations of practice. As an example of this approach in action, Pickering cites the paintings of Wilhelm de Kooning, whose rich, swirling canvases were a product of an experimental, adaptive engagement with the emergent contours and configurations of the paintwork:

De Kooning may have had some initial idea of where he was going in a given work, but he never held to it. Applying the paint thickly, he would look for emergent aesthetic effects—swirls, vortices of color, chance juxtapositions. [...] His painting was a continual back-and-forth movement between perceptions of emergent effects and attempts to heighten them, leading in an open-ended fashion to canvasses that no one, including the artist himself, could ever have planned or anticipated in advance. (2)

Here, the very process of engaging with different energies and materials takes precedence over the initial starting conditions and the outcomes that emerge—

the overarching motivation at work is to explore and to participate in the world's unfolding in real time, and thus enact its potential. Beyond the domain of art, and presaging his full length discussion of the subject in *The Cybernetic Brain*, Pickering's introduction cites subsequently the science of cybernetics as a paradigm that bears out this adaptive, exploratory way of being in an unpredictable world, developing machines that prioritise being an effective co-performer in a matrix of agency over and above the acquisition of complete knowledge and control over their surroundings.

Pickering's introduction to *The Mangle in Practice* demonstrates the role of art in providing 'philosophical objects', as he terms it, for clarifying and crystallising these otherwise abstract stances. In *The Cybernetic Brain*, he develops this concept into what he terms 'ontological theatre', as a means of encompassing technological formations whose functioning bears out particular conceptions of knowing and being. It is this contention that underpins much of the analysis taking place across this thesis, characterising not only how digital literary texts can be approached, but also the politics they express. In the particular case of *Roulette*, the challenge it presents to the reader can be understood in terms similar to that facing the human agent in a highly complex, nonhuman world—of how the emergent behaviours of the latter, whose underlying structures and imperatives are difficult to discern within the limited spatiotemporal envelope of human perception, can be engaged and understood within the practices of knowledge-making. One response could be to arrest the text's behaviours by imposing an abstract schema of control over them—to narrow down its expressive potential by actualising it in a systematised manner. Alternatively, the reader could make her selections on an experimental and open ended basis, refusing to direct the reading encounter along a particular line of becoming, and seeking instead to maximise the novel combinations of outputs as these emerge through practice.

Neither of these stances is specified for the reader within the interface mechanisms of *Roulette*, and it is this openness that allows the text to be accommodating to both modern and nonmodern approaches. By inviting the reader to consider explicitly how she will engage and negotiate the textual performance, *Roulette* is able to stage, at a small scale, how differing stances towards the world's becoming can have a transformative impact on the practices and understandings that emerge subsequently—to become an instance of

ontological theatre, in Pickering's sense of the term. Nevertheless, beyond the immediate dynamics of the performative exchange, the status of *Roulette* as a computational artefact, and of its operational characteristics as such, constitutes another key factor in this scenario. The significance of this lies not simply in that it delimits the ultimate extent of the reader's ability to shape her encounter with the text, but also because its functional parameters constitute an important context in which the textual performance can be evaluated as a particular expression of knowledge-making. The insights gained here are of importance equally to a performative understanding of Waber and Pimble's *I, You, We*, and so it is towards this aspect that the discussion will now turn.

3.3. Resisting the Nonmodern

3.3.1. Constraint

The performative encounter between the reader and texts such *I, You, We* and *Roulette* can be read as offering characteristics that lend to their evaluation as preliminary instances of nonmodern practice—as fostering a forward looking search for creative and critical possibility within an ever surprising world. Nevertheless, in thinking through the ways that digital technologies shape and colour the context in which these possibilities are actualised, perceived, and interpreted, there are a range of aspects that need to be acknowledged, not least those which have the potential to disrupt any straightforward reading of these texts through the complementary lenses of the performative and nonmodern idioms.

In the case of *I, You, We*, the first point to be observed is that despite the rich variety of graphical and semantic constellations that can be yielded by its rotating scriptural field, the linguistic units which constitute these possibilities are themselves affixed in space. That is, they are mapped onto inert geometrical primitives, a series of cubical lattices, and whilst the reader has the freedom to rotate these structures in any way she desires, they retain their essential form irrespective of their orientation in space. The fact that *I, You, We* is a constructed digital artefact means that these particular spatial arrangements will have been specified and encoded at the level of its underlying software architecture, as opposed to arising from indeterminate processes. This situation prevails equally

in the case of *Roulette*, for in spite of presenting a scriptural field that is in a state of continual flux, in the form of the rotating cubes that constitute its primary interface mechanism, these animations are enabled only through a carefully arranged matrix of algorithmic instructions. The underlying rigidity of their outward spatial logics is indicative, therefore, of how, as technical artefacts, *Roulette* and *I, You, We* are founded on absolute structures that seem inimical to the sense of novelty, emergence, and unpredictability that characterise a nonmodern mode of expression.

The structural immutability of *I, You, We* and *Roulette* is reflected not just in the stability of the observable qualities they make apparent, but also more broadly in their very existence as distinctive technological artefacts—which by extension includes the greater digital infrastructures necessary to support their functioning. Irrespective of the surface dynamics characterising the reader's encounter with these texts, the underlying mechanical properties of *I, You, We* and *Roulette* are neither disrupted nor permanently reconfigured as a result of these engagements. Moreover, it can be noted that the multiple software systems involved in actualising the text—the *Java* runtime environment, the reader's chosen web browser application, the operating system on her access device—are all standardised, commercially oriented technologies that have a common footprint across myriad digital systems. The shared demands of commerce and industry for simplicity, stability, and reliability have driven the development of standardised software and hardware architectures that provide a carefully specified environment in which different computational activities can take place without destabilising the surrounding web of technologies that enable them.

From the standpoint of a performative critical analysis, these observations have the potential to be significantly problematic, putting into question whether any digital literary text can be understood legitimately as embodying and enacting a nonmodern vision of the world as an unpredictable, emergent formation, whose unfolding is to be explored rather than arrested. The key question, therefore, is to what extent a performative framework can accommodate these challenging technical resistances to its critical imperatives.

3.3.2. Complicity

Questions concerning the disruptive potential of new technologies in the hands of writers and artists to open up new ways of thinking and acting in the world are far from new in the study of digital literature. A substantial early intervention on this topic was made by Martin Rosenberg, a theorist of science, technology and culture, in a 1994 paper entitled “Physics and Hypertext: Liberation and Complicity in Art and Pedagogy”, which was included originally within *Hyper/Text/Theory* (1994), a critical reader on hypertext writing and technology edited by the literary critic George Landow, and which remains of particular relevance to the concerns of this discussion.

In his paper, Rosenberg argues that many of the contemporary claims being made for the technology of hypertext as a tool of political and pedagogical liberation must be read in the context of longstanding discursive exchanges between the physical sciences and creative practitioners working, however implicitly, in the tradition of the avant-garde—challenging habituating patterns of thought using differing manifestations of art, literature, and philosophy. These continuing exchanges, for Rosenberg, are predicated upon two very different descriptions of the universe from a scientific standpoint: a universe that consists of ‘precise, deterministic, and reversible laws’—a universe with an essential being—as compared to one that is driven by irreversible, contingent, and indeterminate processes—one that is forever in a state of becoming (269). Rosenberg argues subsequently that this dialectic between determinate and indeterminate phenomena, between being and becoming, has taken on numerous ideological imperatives in the context of artistic and philosophical debates concerning the nature of freedom and power in modern society—citing Donna Haraway’s influential deployment of the cyborg image as a prime example of how particular ideological vectors become mapped onto certain interpretations of physical phenomena:

Haraway’s initial opposition [between determined mechanism and contingent organism] may be explained strictly in terms of competing theories of noise as entropic threat or negentropic possibility [...] Haraway’s celebration of noise, contingently present in an otherwise determined channel of communication, plays directly on the doubled condition of threat

and promise associated with entropic processes. She employs these tropes ideologically in order to align tactics of resistance with the laws of thermodynamics, in opposition to tropes of precise causality associated with the laws of dynamics and aligned with the conditions of domination. (269)

Haraway's depiction of cyborg political practices as being 'noisy'—disruptive of existing technical, cultural, and social orders—is, for Rosenberg, rooted in imagery that arose in response to the establishment of the thermodynamic laws, in which the entropic breakdown of material structures and processes becomes both a threatening development and the very conditions of possibility for new arrangements to emerge.

Hinted also in the above passage is another key aspect of Rosenberg's argument: the 'trope', as deployed by the literary critic Hayden White, which is 'a turn of phrase linking an abstract concept to the physical world, thus establishing a correspondence between the physical world and human ideation' (271). Although Rosenberg acknowledges that tropes are provisional tools that constitute a necessary part of the discursive frameworks supporting the human sciences, the fact that they 'demonstrate their truth only by assuming some essential connection between word and thing' is highly problematic from an artistic and pedagogical standpoint, especially when deployed within the space of other discourses for the task of promoting particular ideological vectors—a deployment that can often obscure the many forces involved in constituting a trope that would otherwise counteract the very ideas being expressed (271). It is in this sense that Rosenberg argues that many early hypertext theorists, in proclaiming the 'revolutionary' potential of a new technology to liberate its users, had entered into a discursive matrix founded on an array of physics tropes that maintain an opposition between a natural-cultural domain of determined being versus one of liberating becomings.

The rest of Rosenberg's paper is dedicated to explicating the various tropes employed within the rhetoric of a number of hypertext theorists, critiquing their implied correspondence between specific physical laws and specific properties of computer mediated textuality by way of validating the latter as a potent medium for art, pedagogy, and liberatory politics. Rosenberg focuses in particular upon the tropes of 'nonlinearity' and 'contingency', which underpin the claim that hypertext empowers the reader by enabling her to actualise the text in a manner

of her own choosing. That is, by allowing the reader to navigate selectively through the rich web of differential connections that constitute a typical hypertext—as opposed to following a strict trajectory preordained by the author—the technology enables the reader to experience the sense of contingency necessary for her cognitive liberation from the habituating thought patterns that characterise and sustain Western society and culture:

From this perspective then, linear thinking represents the prison house and nonlinear thinking offers liberation from that prison: freedom of thought becomes literalized in a virtual environment in which the programmer takes the initiative, and victory occurs when this virtual liberatory hypertextual realm wages war on the structures of thought brought to this virtual reality by the “naïve” interactive consumer of hypertext, or so we would like to believe. (277-8)

Rosenberg is highly critical of this rhetorical linking between the contingencies of choice and the reader’s liberation from existing sociocultural formations. The basis of his critique is with regard to the ontological visions embedded within the software architecture of hypertext itself—observing the spatial relations between textual links and individual scriptural nodes, and considering their geometrical properties in light of numerous genealogical resonances between geometry, calculus, and logocentric thinking. It is on this basis that Rosenberg contends that the very idea of the reader being empowered through the technology of hypertext is one that is explicable more readily in terms of control and domination than of anarchy and liberation:

[Part] of the charm associated with this new “writing space” also has to do with the capacity of “wreaders” to jump through links from *lexia* to *lexia*, forwards, backwards *at will* [...] a wreader who can gain an instant, transcendent perspective of the wreading trajectory. This control over experience, exemplified by the “function” of a transcendence to detach the observer from the phenomena being observed, reminds one of the control over the natural environment enabled by the calculus of Leibnitz and Newton, a control that enables astronomers to track the motions of planets or comets forwards and backwards in time and gunnery officers to estimate

the trajectory of shells in order to maximize their “effect.” So, all contingencies available to the wreader become domesticated by his or her complete control of the process of choosing direction. (274)

Rosenberg elaborates further this comparison between the structures of hypertext and those of mathematical calculus by describing how the latter is predicated upon a deterministic vision of a purely geometrical universe—one whose properties are sufficiently delimited as to be regarded as being essentially atemporal in nature. That is, the structures of calculus work to spatialise the behaviour of physical systems into an infinite series of discrete states whose casual relations are clearly discernible, thereby permitting their past and future trajectories to be mapped out in their entirety. From this perspective, the behaviours exhibited by physical systems in phase space are assumed to be unaffected by the intrusion of irreversible contingencies over time, such as those caused by thermodynamic entropy, which can only be quantified through the use of statistical approximations rather than immutable laws.

In the context of comparisons between hypertext and scientific models of the universe, Rosenberg argues that the experience of navigating through a work of hypertext serves to articulate this geometrical, atemporal worldview, for whilst the reader’s trajectory may be nonlinear in the sense that it can express multiple vectors through the discrete spaces afforded by the system, the text as a whole remains unaffected by these choices as they occur in time. In other words, the mechanical structures of the system are neither disrupted nor irreversibly altered by the reader’s engagements: ‘the technological environment of hypertext remains [...] functionally indifferent to the chosen trajectory of the wreader’ (275). In light of this, Rosenberg concludes that the spaces of hypertext more closely resemble the deterministic phase spaces described in calculus, wherein every possible state of the system can be isolated, rather than an unpredictable environment whose contingent behaviours disrupt the technical and conceptual foundations of the Western sociocultural milieu. Therefore, whenever theorists invoke the trope of ‘nonlinearity’ to describe hypertext they are, for Rosenberg, referring to a property better understood by physicists as ‘symmetry’ or ‘reversibility’, in which the becomings of time and entropy are ignored when describing the states exhibited by a physical system.

Rosenberg is clear that the ontology of being expressed through the structures of hypertext constitutes a powerful counter to any naïve depiction of the technology as a source of transformative becomings within the structures of contemporary society. Indeed, it still represents a challenging perspective in relation to more contemporary forms of digital literature such as *I, You, We* and *Roulette*. Despite the apparent dynamism of the scriptural outputs generated by these texts over time, their structural integrity and stability as digital artefacts remain unaffected by the performative exchange, as are the stable interface configurations through which they are enacted. Whilst these factors may not preclude a performative dynamic between the reader and the text, it does pose a serious question concerning whether this can be read meaningfully as a viable instance of nonmodern practice. Therefore, in arguing for digital literature as a means of enacting and exploring alternative modes of knowing and being, this troubling suggestion of a genealogical link between a deterministic, modern worldview and the deep technical structures underlying the genre as a whole must be tackled.

3.3.3. Exploration

In order to reconcile the genealogical heritage of digital technologies with a reading of digital literature as a form of nonmodern practice, it is possible to cite another paper included within *Hyper/Text/Theory* that was written by the author and media theorist Stuart Moulthrop: “Rhizome and Resistance: Hypertext and the Dreams of a New Culture”. Moulthrop’s paper outlines a direct response to the challenges presented within Rosenberg’s argument, considering the extent to which the structures of hypertext can provide a mechanism through which novel perspectives on the relations between technology and culture can be generated, and so evaluating the progressive value of the intersection of computing technologies and artistic expression—an investigation that is instructive for the problematics facing a performative analysis of more contemporary instances of digital literature.

Initially, in a manner similar to Rosenberg, Moulthrop relates the claims of hypertext theorists back to a confrontation between two opposing cultural registers, these being identified by the post-structuralist philosophers Gilles Deleuze and Félix Guattari as the ‘smooth’ and the ‘striated’ (300). Reminiscent

of Rosenberg's dialectic between being and becoming, the 'smooth' spaces of culture and society are characterised as being emergent, processual, and transformative, whilst those of the 'striated' express the paradigms of identity, specification, causality, and routine. It is in light of this opposition that Moulthrop enquires initially as to whether hypertext can be understood legitimately as 'a laboratory or site of origin for a smoothly structured, nomadic alternative to the discursive space of late capitalism' (304). Almost immediately, Moulthrop encounters a problematic similar to that identified by Rosenberg regarding the functional structures of hypertext technology, observing that they must embody by necessity a high degree of order, stability, and routine if they are to be expected to work at all:

Hypertext systems are entirely routinized; comprised of discrete rules and relationships, designed to be regular and reliable even in their "vastness and randomness." [...] no amount of apparent multiplicity can exonerate hypertext of its complicity in military-entertainment-information culture [...] Lines are still lines, *logos* and not *nomos*, even when they are embedded in a hypertextual matrix. Such matrices are always edifices, never autonomous zones; they are structures that do not allow for deterritorialization. No technologically mediated link can ever constitute a genuine light of flight. (310)

Acknowledging Rosenberg's argument, Moulthrop accepts that hypertext can never be characterised as an absolute alternative to striated discourse and culture, but he uses this moment of ideological failure as a starting point to consider whether a more interesting critique of hypertext can be derived from an extended practical engagement with the form. For this end, Moulthrop considers an alternative stance, in which hypertextual discourse is characterised not as 'a wholesale embrace of indeterminacy, but rather as the articulation of global variability in tension against local coherence' (308).

Moulthrop illustrates this stance in action by recounting an exercise he held previously with his students, asking them to interrogate, resist, and subvert the multiplicity and variation exhibited by a specimen hypertext in order to develop their own interpretation and evaluation of its principal characteristics. Whilst many of his students wrote conventional papers, another student, Karl Crary, modified

the hypertext itself: attaching a critical commentary that attempted to reduce the heterogeneity of the text into a handful of taxonomic categories. Moulthrop considers this particular exercise to be an illuminating failure: a critique predicated upon the kinds of observer detachment and logocentric absolutes that enable striated discourse in the first instance, yet whose material engagement with the form of hypertext ensures these same efforts will be transformed recursively and disrupted continually by the very technologies they seek to control. It is this which leads Moulthrop to conclude:

[Crary's discovery] is practical proof of a principle expounded by Deleuze and Guattari, namely, that smooth and striated spaces "exist only in mixture: smooth space is constantly being translated, transversed into a striated space; striated space is constantly being reversed, returned to a smooth space" [...] The dyad of smooth/striated space represents not a dialectic but a continuum [...] Our work in hypertext will involve a constant alteration between *nomos* and *logos*. We will create structures which we will then deconstruct or deterritorialize and which we will replace with new structures, passing again from smooth to striated space and starting the process anew. (316)

In short, the technology of hypertext provides a space in which established structures of knowledge and perception are shown to be a constant state of process: crystallised, upheld, and unravelled by a multiplicity of intersecting forces, both human and technological, which catalyse and shape in turn the becoming of other such structures.

Writing in 1994, Moulthrop avoids making any claim as to where such experimental engagements with the technology of hypertext may lead ultimately, but his practical reconciliation of critical idealism with operational reality provides an early precedent that illustrates how a nonmodern understanding of digital literature can accommodate the challenging technical resistances presented by the medium itself. The basis of this understanding can be found in Moulthrop's exploratory open-ended stance towards a then-new technocultural phenomenon—a willingness to evaluate it through practice, to see how it unfolds, as opposed to theorising it in the abstract, where absolutist accounts of radical liberation or wholesale overdetermination can thrive unopposed.

In the entangled dance of agency between human and machine, their mutual resistances and accommodations articulate the space in which the agential attributes of both are constituted and shaped in the mangle of practice. Moulthrop views this exchange in terms of the smooth and the striated in mixture, with both idioms manifesting concurrently across the transformative and stabilising attributes of the encounter between the reader and the text—their entanglement acting not only to delimit their agential capacities, but to catalyse through this the production of knowledge, as new paths of practice and insight become available in the performance. By experimenting with the striated architecture of hypertext, Moulthrop saw that it was not an insurmountable barrier to the interpretative agency of the reader, but a demonstration of how such constraint is a necessary predicate of critical practice—rejecting the abstractness of conceptual purity in favour of the more challenging but intellectually productive domain of experimental possibility. The structures by which these practices are sustained and respond do not constitute unyielding absolutes, therefore, but are adaptive, agential forces in their own right, and thus capable of facilitating the production of new ways of reading and enacting digital technologies.

In the case of contemporary works of digital literature, such as *I, You, We* and *Roulette*, it can be understood that the fixed structures of the digital medium and their particular software architecture constitutes the very condition of possibility for a nonmodern understanding of their functioning. Initially, these systems provide the structures of resistance necessary for a dialectical exchange to develop between the reader and the text—requiring the former to respond creatively to the outputs generated in the real time of practice, as opposed to restructuring the system so as to better reflect her framing of the situation. Consequently, despite the functional rigidity of the technologies necessary to support and articulate digital literary texts, the fact they can facilitate such performative encounters in the first instance suggests that far from being absolute structures of domination and control, they may be presented instead as resistive architectures that can be engaged creatively so as to open up new possibilities for action and expression. Although the example of Moulthrop's student demonstrates one possible response to these creative challenges—echoing the modern readings of *I, You, We* and *Roulette*—the exploratory, nonmodern attitude that Moulthrop derives from this effort is revealing of the fact that

alternative stances are equally possible and viable—emerging out of these structures of practical and intellectual constraint.

It is on this point that this reading of Waber and Pimble's *I, You, We*, and Howe and Molina's *Roulette* can be concluded. As instances of nonmodern practice, these texts reveal how the progressiveness of this stance lies not in the abstract—in a domain where structures of thought and practice can be divided neatly into those which are either complicit or resistant to existing configurations of knowledge and power—but through the mangle of practice. Neither entirely fluid, nor overdetermined by the rigid technical structures that articulate them, *I, You, We* and *Roulette* reveal the mechanical and the emergent as being reciprocally constitutive of one another—whether in terms of their scriptural outputs, the reader's engagements with the digital medium, or the greater technical infrastructures necessary to support their functioning. Both these texts demonstrate how the contemporary technocultural milieu is not an absolute formation that articulates an unyielding set of knowledge-making principles, but is instead emerging and transforming continually as it is actualised and interpreted in the real time of practice. It is from this perspective that a performative critical approach towards digital literature can be summarised appropriately, offering a way of reading these texts so as to explore the very conditions by which different possibilities in the world are realised: as a dialectical exchange between resistive structures and disruptive occurrences in the material enactment of the world.

4. Articulations: Enacting the Algorithm

This fourth chapter continues the work of the previous in testing the critical efficacy of reading digital literature from a performative standpoint. However, the focus here differs in exploring how this framework can be applied to texts whose capacities for observable change manifest independently of the reader, deploying algorithmic routines for sequencing novel outputs using a finite array of specified primitives.

Initially, it should be noted that this ostensible division between what may be described crudely as ‘interactive’ versus ‘generative’ digital texts is transited frequently by many extant works of digital literature. Indeed, both the texts explored in the previous chapter, Waber and Pimble’s *I, You, We*, and Howe and Molina’s *Roulette*, embody characteristics that are apparent across both these categories: enabling the reader to manipulate the scriptural field along prescribed input channels, but featuring also significant independent behaviour, with the former generating randomly the verbs that populate the ever shifting field of view, and the latter selecting different outputs on the reader’s behalf.

Nonetheless, by paying specific attention to texts that require the reader to establish only the conditions necessary for the subsequent performance—accessing and initialising them using suitable equipment—a space is provided in which to consider in more detail the status of digital literature as a computational art form: the structures governing its functioning in real time, their effects upon the expressive agency it can exhibit, and how an awareness of these qualities affects the context in which the work as a whole is perceived and understood.

As considered in chapter one, there are many scales at which the technology of digital literature can be examined: from the specific algorithms that articulate the immediate characteristics of the text, to the software and hardware systems necessary for enacting these instructions, to the energy infrastructures that power all digital technologies. In its particular conception and deployment of performative critical principles, this thesis has subordinated its depiction of the technology to its role in structuring the immanent dynamics of the reading encounter, and so pitching the analysis at the level of the expressive surfaces maintained by a text’s constituent algorithms.

This empirical approach serves in part to address the problematic identified in chapter one concerning the work of theorists such as Matthew Kirschenbaum,

who advocated a forensic analysis of digital code, but underplayed subsequently some of the practical and ethical challenges involved in gaining access to current software. However, in exploring generative digital texts, this chapter contends that their evolving surface characteristics draw particular attention to the algorithmic procedures underpinning them—doing so to a greater extent than other types of digital literature owing to their relative autonomy. Specifically, it is contended that these procedures manifest in such a way as to expose and critique their core functional principles—namely, their assumptions concerning the amenability of the observable world to being emulated and engaged through fixed sequences of instructions. Generative digital texts are thus depicted as expressing how these assumptions condition the ways that digital technology engages, assimilates, and transforms the greater material environment of which it is part.

Such insights are of value for advancing a performative understanding of all digital literary texts, for they help to relate their performative behaviours back to the algorithmic processes shaping the contemporary technocultural environment, and so provide an opportunity to consider in more detail the potential for progressive thought and practice to emerge from its constituent structures. Consequently, this chapter pays even closer attention to an issue raised repeatedly throughout this thesis so far: how a technical and cultural paradigm that channels human and nonhuman activity into strict, computationally amenable forms can also function as a source of novel, unpredictable developments in the world's becoming. This chapter develops thus the argument that digital literature is an exploration of the performative exchanges that characterise the enactment of digital computing, with these texts providing a small scale model of these dynamics, and so demonstrating concurrently their existing limitations and future possibilities.

The chapter proceeds initially by conducting an overview of the genealogical developments that led to the emergence of generative digital literature, outlining how its key characteristics were inaugurated at a very early stage in the history of digital computing, and grew out of a number of pioneering advancements in the use of this technology within artistic practice. Having discussed the basic dimensions of these texts as they emerged over time, the chapter then explores how these manifest across a number of contemporary examples: *When You Reach Kyoto* (2005) by geniwate and Brian Kim Stefans, *JABBER* (2000) by Neil

Hennessey, and *synonymovie* (2004) by Eugenio Tisselli. Unlike the previous chapter, in which the example texts were discussed separately, the focus of this discussion on the principles underlying the technology of all generative texts necessitates a synthetic approach, with the selected examples being examined and compared concurrently.

In evaluating these contemporary generative texts, this chapter outlines two contrasting perspectives on the algorithms that underpin their functioning, considering how these structures express both Pickering's modern and nonmodern visions for encapsulating the world, and so dramatise the relationship between these two worldviews as they manifest across the wider digital milieu. The chapter concludes by relating this understanding of the algorithm back to the performative encounter between the reader and the generative digital text, deploying the work of the humanities computing theorist Bethany Nowviskie to demonstrate how the experience of reading these texts can be characterised from the same performative critical standpoint as used for expressly interactive works of digital literature. Moreover, it is argued that these particular texts are demonstrative of a form of nonmodern algorithmic knowledge-making, in which the rigid functioning of delimited technical structures and the adaptive behaviours of human agents combine to produce an encounter that enacts, at a small scale, the open-ended search for expressive possibility within a digital environment—as opposed to following the hypothesis and outcome driven imperatives through which it was developed.

4.1. A Generative Genealogy

Digital prose and poetry generation systems occupy a significant historical niche in the technical evolution of digital literature, and continue to represent a notable aspect of the contemporary genre—whether in the form of standalone works or as a specific attribute of others. The media theorist Noah Wardrip-Fruin cites the earliest example of a text that harnesses digital computing for literary purposes in a computerised love letter generator created by the mathematician Christopher Strachey in 1952, utilising the Manchester Mark I general purpose computer (“The First Digital Artist?”). At the heart of this early digital text was an algorithmic random number sequencer that had been developed previously by the pioneering computer scientist Alan Turing. This algorithm was used to manipulate an electronically stored template letter by replacing its verbs, nouns, and adjectives with arbitrary selections from a stored vocabulary list—the final outputs being conveyed using a teletype printer. An example of these outputs is reproduced below, the end initials standing for ‘Manchester University Computer’:

Honey Dear

My sympathetic affection beautifully attracts your affectionate enthusiasm. You are my loving adoration: my breathless adoration. My fellow feeling breathlessly hopes for your dear eagerness. My lovesick adoration cherishes your avid ardour.

Yours wistfully

M. U. C. (qtd. in “The First Digital Artist?”)

Wardrip-Fruin argues that the artistic value of Strachey’s project was not to be found in its resolutely maudlin output, but rather in the technical means by which this was achieved—pointing out that the primitive state of the software developed by Strachey enabled it to serve as a pioneering instance of how a technically simple system could be used to generate a seemingly endless array of scriptural variation: ‘Strachey had discovered, and created an example of, the basic principles of combinatory literature [...] Combinatory techniques allow a relatively

small number of initial materials to be arranged, following certain rules, into a vast number of possible configurations' ("The First Digital Artist?").

Although Strachey's generator, developed purely for its novelty value, would have no direct influence upon the future evolution of digital literature, the combinatory principle that it demonstrated would go on to form an essential component of later efforts to develop systems for generating pictures, poems, and stories using computerised algorithms—iteratively combining or modifying an array of designated primitives in order to assemble novel output forms. Some of the earliest sustained work on the application of algorithms for the generation of artwork was undertaken in the early 1960s by artists such as Frieder Nake, George Nees, and A. Michael Noll. Nake's *Matrizenmultiplikation* series made particular use of combinatory principles as a way of meditating self-reflexively on its electronic origins, emerging through a process of multiplying a grid of numbers by itself using a computer, with each number being assigned a particular colour, before printing out the results using a plotter machine—the final images providing a visual depiction of the algorithmic operations behind their production (see. fig. 20, page 128).

A selection of Nake's algorithmic works were included as part of a pioneering 1968 exhibition at the Institute of Contemporary Art in London, 'Cybernetic Serendipity', which was dedicated to presenting electronic, cybernetic, and computer art to a wider audience. Nake, along with numerous other artists, documented the technical processes and artistic philosophies behind their submissions in a special edition of *Studio International* that accompanied the exhibition, and amongst the many colourful entries are a number of artefacts that may be described retrospectively as digital literature.

One entry details an algorithmically generated poem created by Nanni Balestrini using stored excerpts from three different sources: Michito Hachiya's *Hiroshima Diary* (1955), Paul Goldwin's *The Mystery of the Elevator*, and the *Tao Te Ching* by Lao Tzu. These excerpts were combined variously using a random number algorithm before being filtered through a series of grammatical constraints in order to output a relatively intelligible poem, entitled *Tape Mark I* (Balestrini 55-6). Another entry in the journal details a similar program created by Eric Mendoza for the production of simple fairy stories and parodies of undergraduate student essays, parsing the word selections of random number

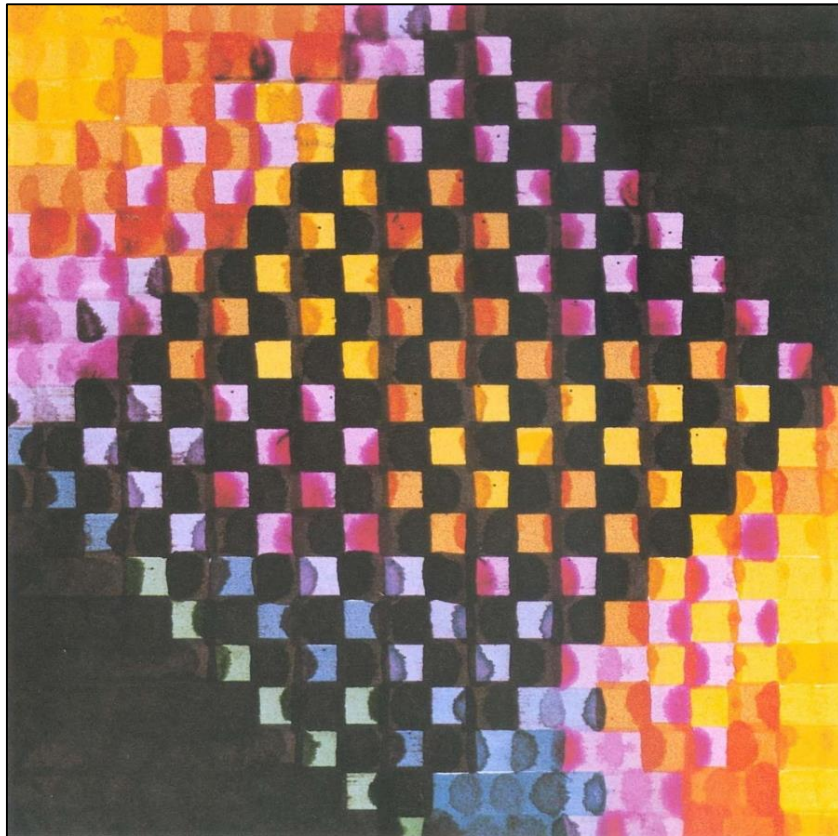


Fig. 20. An example from Frieder Nake's *Matrizenmultiplikation* series. Source: Nake, Frieder. *Matrizenmultiplikation Serie 31*. 1967. Drawing. *Media Art Net*. Goethe-Institut and Centre for Art and Media Karlsruhe, n.d. Web. 9 May. 2014.

algorithms through encoded grammar rules in order to eliminate sequences that would violate narrative causality (Mendoza 58-62). A documented exercise in automatic sentence generation by Jean Baudot offers what is perhaps the most sophisticated iteration of this particular technical paradigm, utilising a mathematical model of simplified French grammar in order to generate an abstract sentence structure that would be filled with randomly selected, yet grammatically appropriate, words from a stored dictionary (Baudot 58).

In all of these texts, the use of random number algorithms provides the core mechanism behind the sequencing of novel scriptural outputs, although unlike Strachey's generator these sequences are always then constrained by a matrix of rules in order to ensure the resulting outputs remain conceptually and grammatically intelligible. On this point, it should also be noted that the very term 'random' number algorithm is in fact a misnomer, for the very architecture of algorithms as a sequence of predefined operations prevents them from generating truly random variables (Haahr). That is, unless they are able to accept

values from a source that extracts chaotic signals from certain physical phenomena, such as radioactivity or atmospheric noise, the numbers yielded by these algorithms will always be ‘pseudo-random’—a product of fixed mathematical formulae which, though exhibiting a high degree of apparent randomness, are in fact predetermined entirely by the steps of their assembly, and so can be repeated *ad infinitum* if the initial starting values are then reapplied (Haahr). This algorithmic interplay between contingency and control remains a notable characteristic of contemporary works of generative digital literature, both in terms of the outputs they make available and the technical means by which these are produced in the first instance.

In order to begin outlining the critical implications of this interplay for the analysis that follows, as it is illustrated by these early works of digital art and literature, it is worth exploring briefly one of the more striking and widely disseminated instances of the combinatorial principle in action, in the form an experiment delineated by the mathematician John Conway in 1970, the ‘Game of Life’. Conway’s experiment, what is now classified as a ‘cellular automaton’, consisted of an infinite two dimensional grid, whose constituent cells could adopt either one of two states, 0 or 1, active or inactive, alive or dead, depending on the states exhibited by each its surrounding neighbours over time. The particular ways in which these cells reacted to one another would be specified in advance using a set of simple rules: i.e. 1) every active cell with either two or three active neighbours will remain active, 2) every active cell with either one or four active neighbours will become inactive, 3) every inactive cell with exactly three neighbouring active cells will then itself become active (Weisstein). The Game of Life would be set into motion once an initial ‘seed’ pattern had been inscribed onto the grid by an external agent, with each subsequent iteration of the pattern emerging as a direct consequence of the states exhibited previously by its constituent cells.

Early experiments with the game yielded intricate cellular patterns that exhibited complex, emergent behaviours over time—unable to be described more efficiently and succinctly by anything other than the rules through which they were generated (see fig. 21, page 130). To an even greater extent than Strachey’s generator and Nake’s artwork, Conway’s experiment serves as a vivid illustration of the most salient characteristics of generative art and literature, two of which

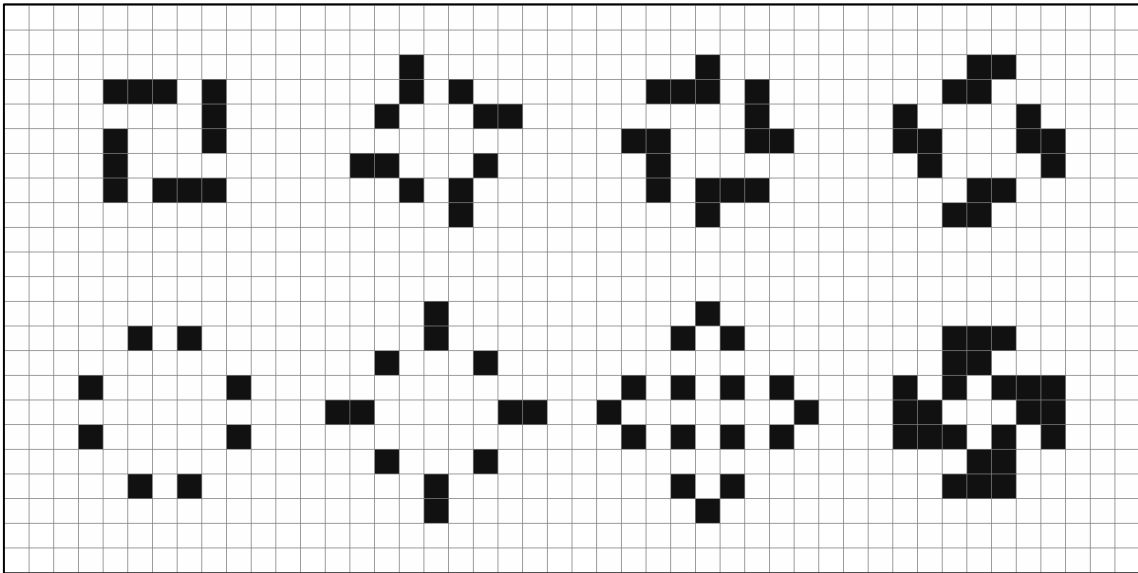


Fig. 21. A simple time lapse illustration of Conway's Game of Life in action. The first pattern, on the upper left, constitutes the initial seed pattern. The patterns following on from this, when viewed clockwise, depict how this configuration evolves over the course of eight discrete time steps.

are pertinent especially to a performative understanding of the latter. Firstly, the Game of Life offers an immediate depiction of the algorithmic processes by which it is sequenced. Like Nike's *Matrizenmultiplikation*, which depicts the matrix of integers generated by its originating software, Conway's experiment visualises the effects of simple algorithmic transformations being applied to a binary matrix over time. In the analysis that follows concerning contemporary works of generative digital literature, it is shown that their very status as generative artefacts ensures a close relationship between the patterns and features outputted and the functional characteristics of the text in question, facilitating a critical evaluation of the interplay between these two aspects as they manifest within space of the reading encounter.

A second point to be observed in this regard is how the Game of Life offers a succinct demonstration of the performative idiom, as defined by Pickering, in action: an ever changing material formation whose particular characteristics at any one moment are the sum of the previous vectors of transformation exhibited by the system as a whole. These emergent qualities are such that whilst the possible range of behaviours that can manifest within the system may be understood fully at a local level—e.g. cellular rule sets embedded within a grid—the global patterns that emerge are unpredictable, owing to unforeseeable

combinations of processes and primitives, and this ensures that the becomings of generative digital artefacts can be registered only in the real time of practice, rather than mapped out in advance. This particular characteristic resonates subsequently with the specifically nonmodern worldview that Pickering delineates in *The Cybernetic Brain*, whereby the causal matrices at work within the world's becoming cannot be known fully or specified using abstract theory alone, but must be observed in a state of process—encouraging practices of knowledge-making that value the experimental realisation of possibility as an end in itself, ramifying the range of behaviours that can be enabled by a system, rather than seeking its subjugation to prefigured goals. On this point, Pickering himself describes cellular automata as an instance of what, as discussed in chapter two, he terms ontological theatre: crystallising nonmodern principles, demonstrating them in action, and presenting thereby an alternative account of how the world unfolds: one that is unpredictable, emergent, and open to possibility (*The Cybernetic Brain* 30). A key contention of this discussion is that a similar argument can be made concerning current generative digital texts: depicting them as an art form whose emergent characteristics articulate at a global level both the performative idiom and the nonmodern approach to knowledge-making that emerges from this way of being in the world.

4.2. Contemporary Generative Texts

4.2.1. *When You Reach Kyoto*

There are a significant number of texts within the first and second volumes of the *ELC* that are listed under the index heading of 'generative'. One such text is *When You Reach Kyoto* by the artist geniwate, alias Jenny Weight, and the poet Brian Kim Stefans, with the latter supplying the scriptural and graphical primitives that geniwate's 'concatenation' software manipulates as part of the textual performance. It was published originally on the website *Machine Poetics*, which grew out of an experimental collaboration led by Braxton Soderman and Jason Brown entitled 'page_space'—a project in which various artists were tasked with developing a digital 'page' field whose contents would be supplied by another writer, exerting a level of algorithmic agency over these contents so as to explore how literary art is enacted and transformed by the digital medium.

When You Reach Kyoto can be described broadly as a meditation on the matrix of digital computing and communications technologies that mediate the experience of the modern built environment—as a network of human and nonhuman vectors that articulate the structure and functioning of this domain, and how it is perceived and understood by these vectors in turn. Upon loading the text in her browser, the reader is presented with the opening title screen, which gives way to a defined window in which the text’s unfolding is then viewed. The differing outputs presented within this space are concurrently visual, aural, and scriptural, and these change and evolve iteratively with every click of the reader’s cursor (see fig. 22, page 133).

One of the salient features of *When You Reach Kyoto* is its presentation of grainy, oversaturated images of a generic cityscape, juxtaposed with a selection of coastal vistas, which constitute the background upon which its scriptural outputs are arrayed. Across the various iterations of the textual performance, different images of either the city or the coast, seemingly pieced together from multiple sources, are shown in selective close-up, amplifying the graphical distortions applied to the original photographic captures. Additionally, these background images fade gradually from view with every movement of the reader’s cursor, although they snap back to full brightness once they have faded out entirely.

A second notable characteristic of *When You Reach Kyoto*, available only to a reader equipped with a suitable audio system, is its emission of a crackling, stuttering, ambient noise—akin to the sounds generated when tuning into a distant radio station. The particular disturbances running throughout these audio emissions appear to vary in response to the visual and scriptural changes exhibited by this text over time, although the precise causal relations are unclear beyond the fact these emissions cease rapidly if the reader elects not to advance the performance any further by clicking on the screen.

In keeping with these noisy, distorted characteristics, the scriptural outputs of *When You Reach Kyoto* are nebulous and highly enigmatic. Scattered across the viewing window, like droplets of rain, are myriad arbitrary letters, accompanied by a handful of distinct words that constitute the primary readable outputs of this text. The selections made available, and their varying spatial arrangements onscreen, appear equally arbitrary, and so consequently any

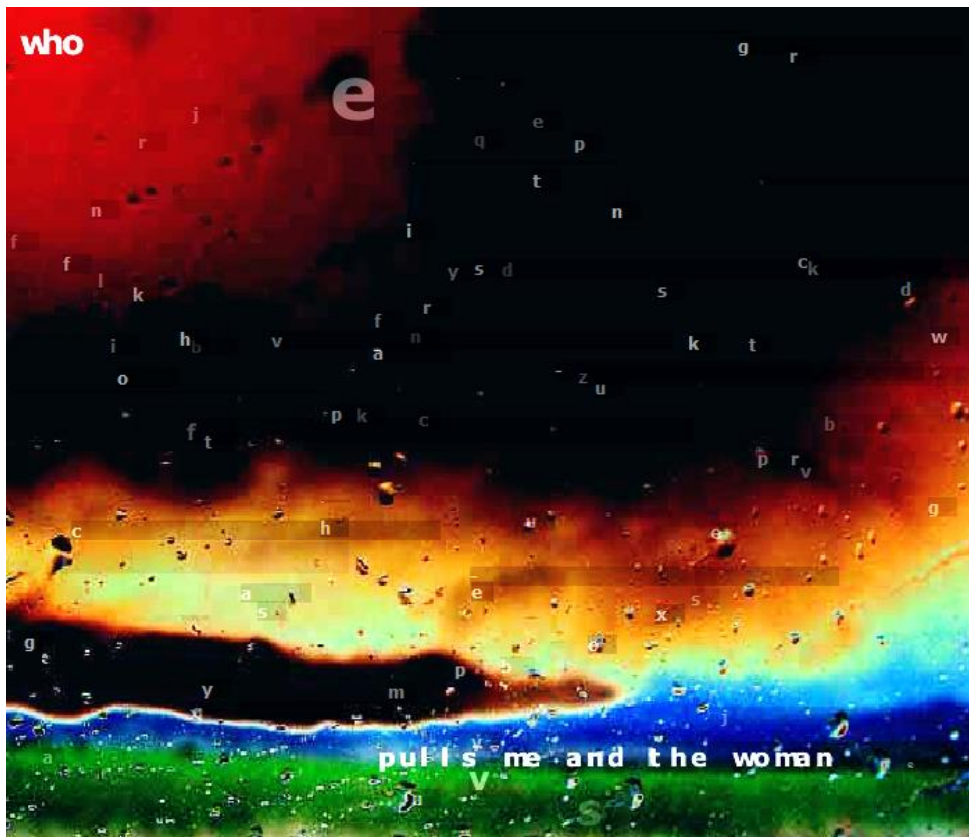


Fig. 22. Typical output screens presented by *When You Reach Kyoto*.

thematic vectors are difficult to discern with any clarity, beyond what might be regarded as transient, figurative allusions to digital technology as it colours the language through which everyday experience is parsed. A typical output sequence is reproduced below, with each line constituting a single screen of text:

I read Tristram Shandy
 now I'm flying down
 quiet is a logical refuge
 she does
 a seam
 including such devices
 in our uneasy strides
 who tells whom
 whitelist
 you run the emotions like data
 she is correcting these poems
 who wrote of a formal eternity
 in the swaying palms of eastern thought

When understood cumulatively, the effect of these scriptural outputs is suggestive of a full length text that has been pulled apart and reassembled according to an array of competing logics, sometimes operating in harmony to produce a coherent phrase, sometimes clashing to the extent that only short, broken fragments are left behind. This understanding resonates with the artist's statement supplied by Stefans to *Machine Poetics*, which is included within its introductory description of the piece:

Anchoring geniwate's page_space is her "concatenation engine" which experiments with the visual and algorithmic potentials within William S. Burroughs' process of the cut-up. Geniwate writes of marrying Burroughs with the computer, "It's been done before, by Florian Cramer among others, but I like to think mine enjoys some level of visual sophistication [...] Of course it's not as random as a cutup; there are heaps of rules determining what gets generated. I'm not so much interested in the surreal aspect of the cutup principle, but in the performative aspect." With text and images from

Brian Kim Stefans the space becomes a surprising emotional and evocative arena in which the random algorithms created by geniwater produce a concatenation of visual and textual effects.

The above description renders the text as being concerned less with the specific outputs it presents, abstract and fragmented as they are, but with the actual process of ramifying different creative possibilities within the performative encounter with the reader. It is here that the diverse combination of visual, aural, and scriptural effects generated become suggestive of the emergent, chaotic dynamics of a world constituted by multiple intersecting processes and agencies, both human and nonhuman in origin. If the urban connotations of its title are included in this reading, *When You Reach Kyoto* expresses a vision of the constructed human environment, and its digital infrastructures in particular, as far from being a pristine reflection of an abstract grid of control—an imposition of order and logic from without—but as a processual, noisy, transient domain. In other words, it is depicted as a field of competing vectors of action and expression, sometimes coming together to produce and sustain different structures of knowledge and agential balance—such as new technologies for negotiating and articulating this environment: radio systems, digital photography, generative art and literature etc.—but also working against these very same formations, breaking them apart at varying rates, recycling them into future developments. The fragmentary acts of representation that characterise the outputs of this text—corrupted audio, distorted images, and scattered words and letters—express the ungraspable complexity of this environment: the transient fragments evoking the myriad activities and processes taking place concurrently, and so animating how this turbulent ocean of agency is forever exceeding the capacity of the representational idiom to contain and articulate its becoming.

4.2.2. JABBER

Neil Hennessy's *JABBER* can be found in the second volume of the *ELC*, and was published first on the author's personal website. The authorial statement accompanying this piece on its entry page offers a concise description of its functioning:

JABBER produces nonsense words that sound like English words, in the way that the portmanteau words from Lewis Carroll's *Jabberwocky* sound like English words. When a letter comes into contact with another letter or group of letters, a calculation occurs to determine whether they bond according to the likelihood that they would appear contiguously in the English lexicon. Clusters of letters accumulate to form words, which results in a dynamic nonsense word sound poem floating around on the screen with each iteration of the generator.

As Hennessey's description suggests, *JABBER* presents the reader with a window that is filled with a pool of randomly generated letters, echoing Howe and Molina's *Roulette* in having these undergo a level of Brownian motion by moving continually around this space and rebounding off one another (see fig. 23 below). Over time, these individual letters become conjoined into word fragments depending on whether they mimic sufficiently the structural characteristics of written English, with this being determined by encoded probabilistic thresholds. Plausible combinations are demarcated by turning blue, with complete new words turning green, whilst those deemed untenable turn red before breaking apart into their constituent fragments. After one minute has passed, the window is cleared automatically and a fresh set of generated letters populate the evacuated space, ready for the next iteration of the combinatory performance.

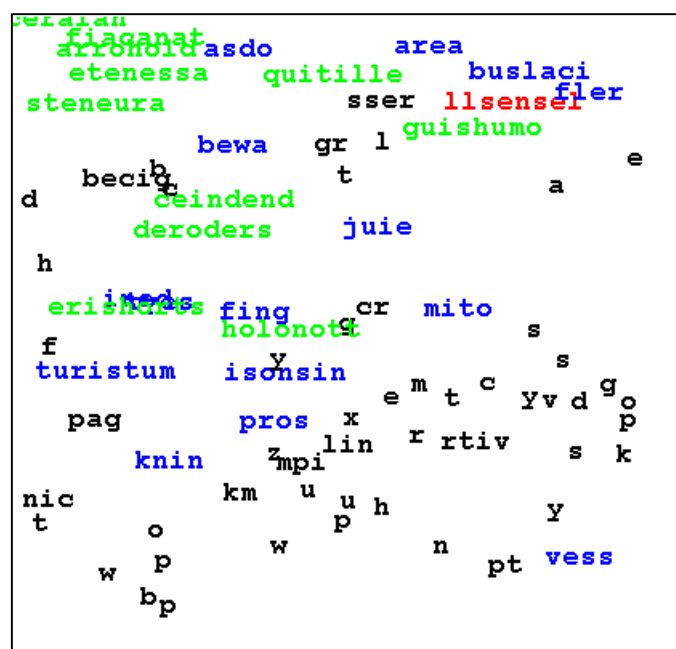


Fig. 23. A typical example of the lexical combinations yielded by *JABBER*.

The emphasis upon principles of emergence and self-organisation bring *JABBER* closer to Conway's Game of Life in terms of its functioning, and like the latter it provides an immediate depiction of the underlying processes by which it operates, displaying in real time the algorithmic steps through which new word outputs are combined, accepted, or rejected. When read from this perspective, *JABBER* functions as an expression of how natural languages are parsed and rendered intelligible from the standpoint of digital computing and communications technologies—of how these systems quantify and encode language as part of the processes by which they assimilate and interact with their surrounding milieu. Stated more directly, *JABBER* demonstrates how, in a digital environment, linguistic units become stripped of any significance beyond the numerical values that encode their constituent markings, bringing them into line with the purely quantitative operations that characterise the functioning of all digital technologies. This visualisation crystallises a space in which to assess the critical significance of the contrast between the interpretative agency of human and machine within the digital literary encounter—of what it reveals concerning the agency of computers to assimilate and influence the world, and how this affects the context in which the outputs generated are perceived and understood by the reader.

4.2.3. *synonymovie*

synonymovie by Eugenio Tisselli is listed in the second volume of the *ELC*, having been published originally on the author's personal website. On its entry page, Tisselli has provided the following description of his piece:

synonymovie generates a sequence of images based on a single word: a "movie" that develops algorithmically through a chain of semantic relations. Initially, *synonymovie* asks the user to introduce a word, which will be the "seed" (as in "random seed," a number used to initialize a pseudorandom number generator) from which the image sequence will unfold. The sequence starts by finding an image related to the word, using an on-line image search engine. Then, a synonym for the word is obtained from a Web-based synonym server, together with its corresponding image, and so forth. The "movie" will end when a word without synonyms (or related images) is found.



Fig. 24. A typical excerpt from the output sequences generated by *synonymovie*—in this case, ‘travelling’ segueing into ‘movement’.

As this passage summarises neatly, the outputs of *synonymovie* can vary in length considerably depending on the range of synonyms and images that can be identified using the search routines available (see fig. 24 above). In working to visualise operations that are foundational to the experience of navigating the modern web environment, and so making explicit its status an artefact that is predicated on this domain, *synonymovie* encourages the reader to reflect on the greater infrastructures that enable all forms of digital expression in the first

instance—of how digital literature, as a particular class of software artefact, is predicated upon an array of technologies that are tied frequently to systems developed for supporting web publishing. Such meditations give cause for evaluating the capacities of expression afforded by these technological formations, as well as the extent to which they might articulate progressive modes of knowledge-making when deployed outside the functions for which they were designed and optimised.

4.3. The Algorithm as Ontological Theatre

4.3.1. Control

Despite the diversity of outputs presented by texts such as *When You Reach Kyoto*, *JABBER*, and *synonymovie*, all are reliant upon algorithmic instruction sets to not only designate but also manipulate the stored array of output primitives they have access to—constituting a genealogical line that reaches back to the elemental simplicity of Strachey’s pioneering efforts, which harnessed only a single random number algorithm and a finite range of static primitives.

Algorithms have their origin in mathematics, and can be described broadly as a class of calculating procedures that are expressed as a finite list of discrete instructions—converting known input states and stored variables into a delimited range of output states after each of these steps have been undertaken. In his treatise on *Computing Machinery and Intelligence* (1950), Alan Turing noted an ontological affinity between digital computation and mathematical algorithms, for both are predicated upon a vision of a world whose processes can be modelled as a series of discrete iterations, as opposed to the continuous vectors presumed by analogue computing (439). Turing described thus the programming of digital computers as necessitating the breaking down of desired tasks into a defined list of steps—that is, as the creation of algorithms (441). The precision and predictability of algorithms provides thus the structural basis upon which all extant digital computers function, ensuring that despite their adaptability and flexibility they can remain predictable and reliable in their operations.

In the case of generative digital texts, it can be recognised that their ability to produce an array of novel outputs is not the organic consequence of greater emergent processes—as these capacities of becoming would suggest—but of

careful developmental efforts by their respective authors, who have constructed the algorithms used to combine or to manipulate different stored primitives prior to their being outputted to the reader. Consequently, if these algorithmic foundations could be rendered observable to an outside agency, then the actual procedures by which a given text can change and evolve—the essential limits of its mechanical agency—would be apparent without it having to be set into motion, for only those actions specified within its constituent algorithms will be undertaken in the real time of practice, excluding thereby the myriad other possibilities its host computing machinery can afford.

However, in spite of this observation, it is worth reiterating the point made in chapter one that the task of unpacking any digital artefact, literary or otherwise, for detailed technical analysis must be considered nontrivial from the standpoint of the average reader—involving the use of dedicated decompiling software and the exercise of considerable technical skill. Consequently, unless this code is made available by the author separately, which is not the case for those listed in the first two volumes of the *ELC*, the only channel available to the average reader for evaluating the technical structures of a given digital literary text is to deduce them through the interface structures it presents as the reading encounter develops.

The significance of this point is that whilst the functional principles of digital algorithms are fully knowable, the lack of readerly access, coupled with the technical flexibility afforded by digital computing systems, renders it impossible to discern with any degree of certainty the precise algorithmic structures implemented by the author in specific instances. As delineated in chapter two and expanded throughout this discussion, a performative critical approach is unperturbed conceptually by the absence of specific knowledge regarding the algorithmic structures of a given text—expressing a variation of Pickering's nonmodern conception of knowledge-making in shifting the focus away from defining, in essential terms, the properties underlying an observable phenomenon, and favouring instead the provisional exploration of its capacities of becoming in the real time of practice. Moreover, as demonstrated by Conway's Game of Life, and even Strachey's love letter machine, generative algorithms are capable of expressing behaviours that are irreducible to the structures through which they manifest, and so even if they are exposed to analysis, and the limits of their agency mapped, the full range of possibilities they afford cannot be

described or predicted in advance necessarily, but must instead be observed in practice. This phenomenon gives additional justification for appraising generative digital texts through their capacities of becoming within the space of the reading encounter, as opposed to defining them in terms of their technical underpinnings alone.

Building on the above point, however, it remains necessary to acknowledge that this tension between algorithmic knowability versus the emergent output sequences yielded is of significance not only when approaching these works from a performative standpoint, but in evaluating the extent to which they can reciprocate this stance and serve as instances of ontological theatre, in Pickering's sense of the term—as providing distinct expressions of nonmodern thought and practice.

In the case of *When You Reach Kyoto*, this tension manifests through the iterative, looping process by which it is actualised. Instead of running autonomously, this text requires a token input from the reader, a single click anywhere on the screen, in order to cue the next stage of the textual performance. This necessity on the part of the reader to advance her knowledge of the text's becoming in discrete steps, using only a single dedicated action, articulates vividly the algorithmic structures by which it is enabled in the first instance. Effectively, the reader is required to enact a simple algorithmic routine, with her agency being pre-disciplined within the reading encounter to the extent that she can articulate only the same basic instruction. Although this reduction of her material agency to that of the computing machinery itself can be read as a nonmodern flattening of the distinction between people and things—a prerequisite of acknowledging the latter's role in human knowledge-making—it is suggestive equally of a modern vision of a world that is reducible to a few universal primitives, whose fixed properties and behaviours can be manipulated in exacting ways so as to produce a delimited range of outcomes.

This modern interpretation of the worldview expressed through the interface characteristics of *When You Reach Kyoto* resonates also with the outputs it makes available. The stream of abstract letters, words, and phrases, coupled with the poor quality background imagery, as well as the noisy transmission of different ambient sound effects, all highlight the role played by digital computing technologies in remediating the constructed human environment. More specifically, in breaking down the apparently seamless surface presentation

afforded by contemporary devices, this low fidelity aesthetic affords a window into how digital remediation is achieved by converting all observable phenomena, irrespective of their origin and their properties, into a sequence of discrete representations—ultimately, a sequence of binary values—so as to be amenable to processing by algorithms—the pixelated imagery, juddering sounds, and jarring, fragmented script evoking the discrete values by which they are encoded. Whereas Strachey’s love letter generator was constrained by the technologies of its time, but could express, as a consequence, the combinatory principles it employed with greater clarity than later, more sophisticated works, the primitive appearance of *When You Reach Kyoto* can be viewed as a deliberate strategy for articulating the technologies of the medium—and, by extension, offering a space in which to consider the modern imperatives of representational abstraction.

Similar dynamics can be observed at work across Hennessey’s *JABBER* and Tisselli’s *synonymovie*. In the case of Hennessey’s text, its real time visualisation of the probabilistic algorithms by which it arranges different word and letter combinations is demonstrative, in a broad sense, of the mathematical reduction of language that takes place across all digital communications networks. The modern conception of ‘information theory’, as delineated by the electronics engineer Claude Shannon in *A Mathematical Theory of Communication* (1948), was developed for the task of defining mathematically how a message can be conveyed efficiently using an invariably noisy channel of communication, and how it can be encoded to both minimise the resources necessary for its transmission and to render it distinguishable from the random errors incurred by its conveyance (Floridi 47). Shannon’s efforts resulted in a probabilistic conception of communication that divorced the signals by which a message is transmitted from the meanings they might articulate, with ‘information’, as a distinct value, emerging from the statistical relations between the possible range of messages that can be emitted by a source as compared to the properties of the message itself, minus the varying levels of uncertainty and equivocation caused by the noise induced by its transmission medium (Floridi 52). Contemporary digital communications networks are predicated thus upon matrices of algorithmic selection routines to disentangle and unpack the most likely messages being transmitted, correcting for errors in real time.

Although the output characteristics of *JABBER* are not a direct visual representation of Shannon's information theory, the behaviours of the former are evocative nonetheless of the algorithmic processes by which message fragments are drawn from the soup of extraneous possibility—'noise', or in this case, random letters—of the digital signal environment, with statistical filters and encoding schemas being used to define which aspects of a fragmented message are most likely to be contiguous. The fact the words themselves are nonsensical from the standpoint of the reader can be understood in light of the fact that digital communications networks place no value on the semantic content of the message signals they might convey, and are thus indifferent as to whether the message itself is a canonical word of the English lexicon or an otherwise unidentifiable string of letters. If an imperative towards the abstract is, as identified by Pickering, a hallmark of the modern worldview, then *JABBER* can be read consequently as a striking depiction of this perspective in action, as it articulated through the digital computing and communications environment—of a world that can be conveyed through representational abstractions alone, insulated from the play of material noise by algorithmic routines and strategies.

The functional logic of Tisselli's *synonymovie* provides another instance of how generative digital texts can highlight the role played by algorithms in articulating the contemporary digital environment—and of the modern ontological assumptions that enable them, in spite of the emergent outcomes they might generate. The basis of this observation can be found in the mirroring between the interface mechanisms of this text, presenting the reader with a simple dialogue box in which to type the words necessary to initialise the system, and those employed by online image search engines. The fact this piece derives its imagery from the World Wide Web by employing similar technologies ensures there is little in the way of fundamental technical difference between the two systems. The resulting chains of synonymous words and images generated can be understood subsequently as an expression of the processes by which such images are structured into databases for the purposes of retrieval and display. That is, the images are rendered accessible to the reader not through any concrete linkages between them—either on the level of their visible contents or through their material properties as digital artefacts—but from the indices that are either appended to each image or are associated with its originating context. From a computational standpoint, these indices are treated as letter strings that have a

corresponding numerical value, making the act of image search and retrieval, at its most fundamental, an act of comparing and matching different strings of numbers algorithmically. The fact *synonymovie* generates highly idiosyncratic, if not outright incongruous, word and image combinations with considerable frequency, highlights the arbitrary nature of this matching process, and so bearing out how the logic of digital computing is predicated entirely upon the systematic manipulation of abstract symbols—a distinctively modern vision.

4.3.2. Contingency

The algorithmic reduction of the world to a body of discrete abstractions, a characteristic that proceeds down to the universalising primitives of digital computing logic, 0 and 1, presents a significant obstacle to reading generative digital texts as viable instances of nonmodern thought and practice. However, a recurrent theme running throughout this discussion has been the way in which apparently knowable and stable technological formations can articulate unpredictable behaviours—establishing not only the basis for a performative dialectic with the reader, but also one in which phenomena that might be grouped variously as expressing modern or nonmodern principles become entangled, emerging from, and then transforming one another in the real time of practice.

It is in this context that an alternative to the above reading of the algorithm as expressing a modern technocultural paradigm can be developed. For this end, it is worth paying renewed attention to the noisy, distorted qualities of the output forms generated by the example texts. In the case of *When You Reach Kyoto*, the reader is confronted by extraneous letters, enigmatic fragments of words, crackling, stuttering ambient sounds, and grainy background images that fade gradually from view. Similar effects are present in the ostensibly erroneous nonsense words generated by *JABBER*, and the often incongruous word-picture combinations yielded by *synonymovie*. Although these shared characteristics are intentional in origin, an expression of different algorithmic routines, their instability and unpredictability evoke also the disruptive presence of computational glitches within contemporary digital systems infrastructure.

In their essay “Glitch”, included within a collection edited by media theorist Matthew Fuller, *Software Studies: A Lexicon* (2008), scholar of digital culture Olga Goriunova and software artist Alexei Shulgin explore the cultural reception

of computational glitches and their political implications. Goriunova and Shulgin contend principally that these emergent eruptions of unexpected, and undesired agency constitute ‘a manifestation of genuine software aesthetics’, revealing how the normative enactment and reception of human-computer assemblages are never straightforward expressions of technoscientific functionalism, but emerge through the entangled exchanges between different technical and cultural paradigms (111). The authors highlight in particular the contrasting imagery that exists between a functional, knowable, and ultimately controllable technical domain, versus one that is interrupted by dysfunctional, alien, and resistive material agency:

Functionality, as a characteristic of established machine aesthetics is always chased by dysfunctionality (if not preceded by it). Functional machines, robots, mechanized people (from Judaism’s Golem, Frankenstein’s monster) to the rebellious computers of the twentieth century) are interpreted as alien to human nature, sooner or later becoming “evil” as they stop functioning correctly.

Glitches are produced by error and are usually not intended by humans. As a not-entirely human-produced reality, its elements are not one-hundred percent compatible with customary human logic, visual, sound, or behavioral conventions of organizing and acting in space.

A glitch is stunning. It appears as a temporary replacement of some boring conventional surface; as a crazy and dangerous momentum (Will the computer come back to “normal”? Will data be lost?) that breaks the expected flow. A glitch is the loss of control. (114-5)

In these passages, Goriunova and Shulgin highlight the disruptive effect of glitches amidst the smooth patina of normative experience. They represent an undeniable eruption of agency on the part of the machine, which, in its regular operations, functions alongside the agential capacities of its human users, ensuring that both enact a tightly predisciplined performance in which any contingency is minimised below an observable threshold. Such stability can sustain the illusion that only human agency is at work in governing the material

performances known as digital computing, but its unintentional breakdown makes explicit the myriad nonhuman forces that are fundamental to enabling and constituting these practices.

Goriunova and Shulgin draw a clear politics from the behaviour and reception glitches, arguing initially that the carefully stabilised and rationalised structures governing the relations between humans and machines, with the agency of both being predisciplined extensively, represents a continuing source of intense social and cultural stress, as the negative effects of certain predominant modes of being become apparent more widely: 'in the technological era, society became organized according to the logic of machines, conveyor belt principles, "rationally" based discrimination theories, and war technology, with an increase in fear, frustration, refusal, and protest' (114). The authors argue consequently that 'errors, inconsistencies of vision, of method, and of behavior' provide a potent framework for artists and writers seeking to respond to these fears and frustrations in their work:

When the computer does the unexpected and goes beyond the borders of the commonplace, changes the context, acts as if it is not logical but profoundly irrational, behaves not in the way technology should, it releases the tension and hatred of the user toward an ever-functional but uncomfortable machine.

Error sets free the irrational potential and works out the fundamental concepts and forces that bind people and machines. An error [is] a sign of the absence of an ideal functionality, whether it be understood in the technical, social or economic sense. (115-6)

Goriunova and Shulgin's contentions here can be redrawn in light of Pickering's own argument concerning the value of a more progressive, nonmodern approach towards knowledge-making. Returning first to his essential point in *The Mangle of Practice*, all technological artefacts are the product of a process of interactive stabilisation between human and nonhuman agents, with their entangled exchanges taming and tuning their respective behaviours so as to perform consistently certain acts of world making—one such being the creation and deployment of technology. Nonetheless, in the context of an agential world

that is changing and evolving continually, such actions are neither absolute nor stable for all time. At no point therefore can human endeavour be characterised as having subordinated entirely the agency of the nonhuman domain. Instead, only a small portion of the world's material becomings can be arrested within a very particular set of interactively stabilised contexts. Hence, although a technological artefact may function correctly across a wide range of material conditions, the dynamism and unpredictability of an agential world ensures that there is always the potential for it to be confronted by liminal scenarios that exceed its adaptive envelope. A computational glitch demarcates a visible rift in the fragile sociotechnical ecology in which all digital devices operate, exposing the brittleness of the modern vision of a tightly circumscribed world—one that reflects an abstract ideal of absolute knowledge, predictability, and control—before showing it to be an illusion sustained whenever the smooth, reciprocal predisciplining of human and machinic agency holds sway. Echoing the emergent behaviours expressed by Conway's Game of Life, whilst the concrete operations of digital algorithms may be comparatively stable, knowable, and predictable at a local level, the global results of their intersection in the real time of practice, across multiple layers of software, hardware, and enabling technological infrastructures, can produce manifestations of agency whose full richness, complexity, and dynamism are impossible to foresee.

A nonmodern attitude towards the task of knowledge-making, as defined by Pickering, recognises this contingency, and instead of treating it as a barrier to be overcome, depicts it as a necessary predicate through which new knowledge and new implementations of this knowledge are made possible. In accepting the impossibility of fully circumscribing the world, a nonmodern attitude prioritises the experimental, forward looking search for the potential inherent within existing structures and practices. In its fullest sense, a nonmodern stance abandons the paradigm of subordinating the world to the testing and fulfilment of abstract hypotheses—even if these may still constitute a catalysing framework for experimental undertakings—and encourages instead the open ended exploration of new developments as these emerge through practice. A glitch, in this context, as a disruptive breakdown of normative patterns of stabilised, and constraining, behaviour, opens new insights into the expressive potential of extant digital systems as they engage with the world's becoming—a point that can be of

particular interest to artists and writers who wish to explore these issues and harness their effects.

It is in this light that generative digital texts such as *When You Reach Kyoto*, *JABBER*, and *synonymovie* can be read as an expression not only of the volatile environment in which digital computers emerge and are required to function within, but of how this mutability can be engaged as part of a progressive form of knowledge-making. The basis of this contention lies in the unpredictability and seeming imperfection of the outputs presented by these texts, which express the emergent instability of the material performances necessary to implement and sustain all digital artefacts, systems, and infrastructures. Whilst generative digital texts are predicated upon algorithmic structures that seek to manage an otherwise unpredictable world, their irregular surfaces betray the underlying contingency of these endeavours. Conversely, however, in cultivating this same volatility within the confines of a dedicated artefact, these texts are expressive also of the nonmodern practices afforded by acknowledging and working with these performances, as opposed to labouring ever harder to control them. Specifically, they demonstrate how the emergent, open-ended synthesis of novel combinations of material in a digital environment is, by necessity, borne through the entangled agency of human and machine in the perception and actualisation of creative possibility. Such agential exchanges, in this context, might be characterised as expressing a form of nonmodern algorithmic knowledge-making—a particular way of approaching the world's becoming in a digital age.

4.3.3. Entanglement

In order to delineate more fully what is entailed by this entanglement of algorithmic agency, human insight, and nonmodern modes of knowing, the performative exchange between the reader and the text in the generative literary encounter needs to be outlined in greater detail. Studying the algorithmic architecture of generative texts from a performative standpoint offers numerous insights into the worldviews expressed by digital computing principles, but how these characteristics translate into a nonmodern heuristic is less apparent than with the interactive texts explored in chapter three—where the reader's inputs and the text's outputs result in evolutionary, open-ended encounters. The question arises therefore as to how this conception applies in cases where the

reader has only minimal influence over the material unfolding of the digital literary encounter, with algorithmic routines being the key driver of observable change.

The humanities computing theorist, Bethany Nowviskie, offers a useful way of considering this issue in her dissertation *Speculative Computing: Instruments for Interpretive Scholarship* (2004), one that resonates strongly with the performative critical imperatives of this discussion. In her dissertation, Nowviskie explores the concrete and conceptual relations that entangle the mechanisms and processes by which humans and machines interpret their surroundings. More specifically, she evaluates these relations as they play out within the space of modern humanities computing projects, in which the material agency of digital computers is harnessed in order to assist the interpretative agency of human beings.

Nowviskie starts her discussion by examining the role of intentional formalism, as expressed through algorithmic methodological principles, in shaping human creative and intellectual activity—whereby creativity is understood as a phenomenon that is enabled best from within a matrix of material resistances and intellectual constraints, as opposed to being left unfettered and unprompted (48). Amongst the numerous examples Nowviskie discusses concerning the value of mechanism as a productive constraint upon the creative pathways of human thought is the work of the French literary movement ‘Ouvroir de Littérature Potentielle’ (OuLiPo) founded by novelists Raymond Queneau and François Le Lionnais in 1960—the name translating roughly as ‘Workshop of Potential Literatures’.

The OuLiPo movement was predicated upon the creation of textual artefacts on the basis of strict rules and instructions, often mapping literary or poetic language onto the structural characteristics and outputs of mathematical algorithms. As Nowviskie observes, ‘OuLiPo’s heightened formalisms [...] were positioned to bend all their rhetorical power toward the provocation of controlled creative response. The value in composition according to the strictures of OuLiPian constraint lay in the degree to which writers were spurred to find creative solutions to puzzling linguistic problems’ (50).

Although OuLiPo has been critiqued as simply offering ‘a device for posing linguistic problems over which to triumph’, Nowviskie argues that this view only ‘holds true if we privilege its ends over its means, the products of algorithmic work over the creative and constructive processes that generate them’ (55). It is here

that Nowvskie counters the related critique that the emphasis of OuLiPo upon systematised creativity—its use of specific formal instructions to channel the creative process along particular lines, algorithms—means that its literary and poetic outputs are effectively predetermined:

[By] emphasizing and concentrating the artist's attention on those elements that—despite the structuring mechanisms of a given constraint—remain open to decision-making, such an interpretation of algorithmic method results in artifacts that are wholly deliberate, carefully crafted. Furthermore, these formalisms demand continual cogitation on the part of the artist, whose latitude for choice has been made clear and who is implicitly encouraged to weigh, balance, and reconfigure his choices. (52)

In other words, algorithmic constraints provide a framework for developing a creative response to the limitations they impose, concentrating the scope of the encounter to few key parameters, which can then be evaluated in detail. Nowvskie extends this point by arguing that algorithmically constrained interpretative procedures, as embodied within humanities computing projects, constitute a space in which the stratified operations of digital computing becomes entangled with the creative and adaptive vectors of human agency—with the former acting as a source of material resistance against the interpretative manoeuvres of the latter, and thus stimulating the emergence of fresh approaches and responses towards the source text, a process that is recast as an end in itself:

In short, what may look inaccessibly, mechanistically algorithmic in (even) the OuLiPian project is better understood as evidence of a ludic algorithm, which we might define as a constrained, generative design situation, opening itself up—through performance by a subjective, interpretive agent—to participation, dialogue, inquiry, and play within its prescribed and proscriptive “computational spaces.” This work may embed within itself a proposed method, but doesn't see its ultimate product as simply the output of a specified calculation or chance operation. In fact, the desired outcome of the ludic algorithm is sheer, performative and constructive enactment of the hermeneutic circle, the iterative “designerly” process we go through in

triumphing over those interpretive or creative problems we pose ourselves.
(55-6)

As an exemplar of the critical value of the algorithm, Nowviskie cites the efforts of Jerome McGann and Lisa Samuels in their development and application of deformative textual criticism. As delineated in chapter two, McGann and Samuels highlight the fact that all acts of textual criticism are deformative by necessity, for they constrain the myriad interpretative possibilities afforded by a given text into particular forms or 'de-forms'. It is here that McGann and Samuels outline a new type of deformative critical practice, in which a computer is used to manipulate algorithmically a digitised copy of a literary source text, a process that yields frequently the kinds of 'aesthetic provocation'—Nowviskie's term—necessary for novel critical perspectives on the text to be generated (63). Nowviskie thus reiterates how the underlying point of deformative criticism is not the production of a series of malformed texts, but rather the creative approaches and novel understandings that emerge from the experimental process behind these acts of deformance.

It is at this point that Nowviskie's argument concerning the value of technological disruption and constraint as a source of critical insight resonates with both the glitch aesthetics of Goriunova and Shulgin and the nonmodern vectors of Pickering's intellectual project. As challenging as the material resistances of the nonhuman domain might be for the activities of scientists and engineers, Pickering observes that the adaptive, dialectical manoeuvres of the mangle of practice constitute a vital component of scientific discovery, and it is in this regard that he champions a forward looking search for experimental possibility in an emergent world. Goriunova and Shulgin note similarly how computational glitches are revealing of knowable, but otherwise hidden algorithmic routines, and are suggestive thereby of the potential for change within what appears to be a singular, self-sustaining environment, but which is in fact maintained only through carefully cultivated exchanges between human and nonhuman agents.

This convergence between the ideas of Nowviskie, Pickering, Goriunova and Shulgin, provides the critical basis on which the performative capacities of the generative reading encounter can be outlined—and, therefore, how it can be understood as a scenario that resonates with Pickering's broader conception of

a nonmodern worldview. By revealing how the finite mechanical agency of the algorithm can become a source of emergent effects, knowable only in the real time of practice, generative digital texts make apparent not only the performances by which they are created and sustained, but demonstrate how a form of nonmodern knowledge-making can emerge out of these exchanges. From the reader's standpoint, the contingent outputs yielded by the delimited structures of these texts possess the same disruptive agency as computational glitches, and so confront her with an ever surprising reading environment that echoes Nowviskie's algorithmic remodelling of printed literature—catalysing, reorienting, and reconfiguring her interpretative agency as the encounter develops. As Nowviskie observes, these algorithmic interventions are critically productive in that they require the reader to respond creatively to the interpretative problematics that emerge before her, and so ramify the meanings of the text in line with its material transformation. There is no end goal specified in this scenario, no preferred interpretative trajectory: its overriding purpose is in fostering novel scriptural and semantic configurations within the space of a performative dialectic between human and machine. This process of experimental interpretation, as it occurs in real time, thus stands as the primary dynamic of the generative reading encounter.

It is this dynamic that can be characterised subsequently as enacting a form of nonmodern algorithmic knowledge-making, in which the agency of a nonhuman formation, as crystallised and cultivated within a digital artefact, becomes entangled with the heuristic agency of a human observer as part of an open ended search for possibility in the world—as opposed to a modern scenario in which the latter develops a singular hypothesis in the abstract, and subjugates the agency of the former in seeking to bear out this trajectory. Although a generative digital text enacts only a very particular instance of this mode of knowing—searching for possibility within a finite array of scriptural primitives—it functions nonetheless as a model of a much larger, nonmodern dynamic that is inherent to the performances sustaining the contemporary digital environment, and which, when taken as an end in itself, becomes a source of novel vectors of action and expression. Whilst the contingent and challenging outputs presented by texts such as *When You Reach Kyoto*, *JABBER*, or *synonymovie* might suggest initially how novelty in the intersection between human and algorithm manifests only in the accidental glitches that disrupt the normative paradigms of

technoscientific functionalism, their systematic realisation of novel and intellectually stimulating output combinations articulates a more expansive view, whereby the algorithmic constraints of digital technologies become a source of constructive material resistances shaping the adaptive vectors of human creativity, continually throwing up new challenges, but presenting subsequently new insights and opportunities for intervention. In this sense, the very existence and functioning of generative digital texts bears out how the contemporary digital environment is not simply a modern domain of absolute control and tightly delimited possibility—although it may seek to treat the observable world in this way—but is open instead to myriad potential configurations, and whose functional rigidity forms a necessary predicate for these configurations to be perceived and then enacted. It is in this way that the act of writing and reading digital literature carries a progressive dimension: as an act of knowledge-making that prioritises this search for, and the actualisation of, novelty within digital systems and infrastructures.

It is on this point that this exploration of generative digital texts can be concluded appropriately. As detailed throughout this chapter, these texts function at multiple levels to express the nonmodern vectors of thought, practice, and agency constituting the contemporary digital environment. At the level of the algorithmic structures that provide the foundation for all digital computing and communications, they demonstrate how their apparent emphasis on modern strategies of control through abstraction must function, by necessity, within a performative, nonmodern environment, and are thus liable to transformation by the emergent dynamics of the latter—as opposed to arresting these possibilities in their entirety. Moreover, these texts provide a vivid manifestation of the creative entanglements between the human and the nonhuman domains that facilitate this potential for transformation, with human agents reading the resistances and unpredictable eruptions of algorithmic agency as presenting fresh opportunities and catalysts for creative intervention, and thus furthering the nonmodern becomings of digital technology.

5. Applications: Performative Digital Scholarship

This penultimate chapter develops the analytical trajectory of this thesis in an alternative direction to that undertaken thus far, moving away from discussing imaginative works of digital literature and investigating texts that are engaged in the discourses of academic criticism, making creative use of the digital medium in developing and presenting their critical observations. In so doing, this chapter relates the nonmodern account of knowing and being back to texts that are concerned explicitly with crystallising novel intellectual perspectives and practices, and so revealing these artefacts to be an appropriate closing instance of what the act of knowledge-making can resemble in a predominantly nonhuman world.

As with the previous accounts of generative versus interactive digital texts across chapters three and four, the empirical divide between scholarly works and those which are imaginative in their intentions and outlooks is contingent and not absolute, given the former employs often the same technologies and techniques to those of the latter as part of their creative exposition of different arguments, approaches, and ideas. For the purposes of this discussion, the cut has been made at the point where the scriptural outputs of a text are expressly analytical in their orientation, or are framed as such initially—seeking to elucidate in detail a nonfictional subject matter and presenting a critical perspective on its properties and significance.

In considering the principal characteristics of these texts, and how these can be understood subsequently, this chapter traces initially their genealogical origins in various hypertext information architectures, from the speculative ‘Memex’ of Vannevar Bush and the technical philosophies of Theodor Nelson, to the more concrete developments of the *Storyspace* authoring environment, the modern World Wide Web, and specialist web journals such as *Vectors*, which is concerned entirely with how the digital medium can be deployed as a tool of critical expression in its own right. It is from the *Vectors* archives that two example works are then analysed in detail, “Narrating Bits: Encounters between Humans and Intelligent Machines” (2005) by N. Katherine Hayles, and “Programmed Visions” (2007) by Wendy Hui Kyong Chun. These two texts reveal how the digital medium can support a performative mode of exploring and engaging different critical vectors, before placing them into dialogue with a broader array of values,

assumptions and frames of reference pertaining to the functional characteristics and operational cultures of digital technology. Specifically, it is contended that in their entangling of the material structures of the medium with the conceptual structures expressed through their scriptural outputs, these texts can be understood as extending the theme identified throughout the previous chapters concerning the performativity of digital literature more generally, facilitating a reading encounter that demonstrates how the world is explored and understood not from within abstract structures of representation but through concrete exchanges between material agents, which contribute to its emergent reconfiguration in real time. These texts do not present simply an account of specific activities, objects, or environments, but enact with the reader some of the practices through which such accounts are specified, upheld, and communicated—demonstrating how these might be reworked and reoriented so as to catalyse new perspectives and understandings. Scholarly digital texts thus crystallise, at a small scale, the kinds of exploratory, emergent practices of knowledge-making that seek to ramify the potential becomings of the world, presenting knowledge as not the abstract absolute of the representational idiom, but as a materially enacted heuristic that emerges from, and contributes towards, and evolving agential environment.

5.1. Information Architectures

5.1.1. Hypertext

In July 1945, *The Atlantic Monthly* published an article written by the inventor, government administrator, and pioneering computer engineer Vannevar Bush on the future possibilities for accessing, distributing, and archiving scholarly materials—entitled simply “As We May Think”. Bush opened his essay by arguing that the traditional methods of communicating the latest results of scientific research, published papers in scholarly journals, were becoming ‘totally inadequate’ for the modern era, in that the sheer quantity of new material being published every year was making it harder exponentially to keep track of the latest developments:

There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. (37)

In seeking to outline an effective solution to this challenge, Bush contended that many of the logistical difficulties involved in gaining access to the records of human knowledge stemmed from the rigid indexical systems employed for their effective organisation—systems that he contrasted with what he considered to be the ‘associative’ nature of the human mind: ‘With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain. It has other characteristics, of course; trails that are not frequently followed are prone to fade, items are not fully permanent, memory is transitory’ (44). Bush saw that if the permanence and clarity of mechanically stored media—specifically, high-resolution photographs transferred onto microfilm slides—could be integrated with a system of selection by association, it would become possible to develop an electromechanical device through which these mental trails could be inscribed permanently (44).

Bush proceeded to sketch out just such a hypothetical machine over the rest of his essay: the ‘Memex’—‘a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory’ (45). The Memex took on the form of a large desk, its interior housing a microfilm library containing many thousands of individually photographed documents. These materials would then be displayed using two projector screens mounted on top of the desk, and the reader would employ a keyboard in order to type in the name of a document so as to have it presented before them. A pair of levers would control subsequently the display of information, allowing the reader to go backwards or forwards through the selected material at any rate of her choosing. Additionally, the system would be designed so that separate pages from separate documents could be linked together arbitrarily in order to form an associative trail.

Bush foresaw numerous advantages that would come with the development of a machine akin to the Memex, including the assembly of new forms of encyclopaedia ‘ready made with a mesh of associative trails running through them’ that would be of particular aid in specific professional contexts, such as in assisting physicians with their diagnoses based upon the symptoms of past cases, or by supplying historians with a web of pathways through which to trace the developmental patterns of a particular epoch (46). Ultimately, Bush conceived of the Memex as a tool through which the inherited wisdom of previous ages could be employed better to heal the ravages of a post-war world, and to set the path of humankind towards a brighter future.

“As We May Think” proved to be of some importance in catalysing further research into the relations between mechanism and human thought in the years subsequent to its initial publication—with these efforts diverging from those surrounding the development of autonomous forms of artificial intelligence and focusing instead on augmenting technically the native capacities of the human intellect. One design of particular note was conceptualised by the philosopher Theodor Nelson in 1965, who documented his vision in a short paper entitled “A File Structure for the Complex, the Changing and the Indeterminate”, which was published first in the proceedings of the Association for Computing Machinery (ACM) National Conference for that year. Within this paper, Nelson delineated a broad vision for how computer technology could be employed to help tackle the

problem of information retrieval within the context of an ever-changing world—particularly with regard to how it could be utilised effectively in the formation of novel ideas and in the exploration of potential solutions to critical problems.

Citing Bush's essay as a particular source of inspiration, Nelson argued that sophisticated automatic document handling, as implemented by an electronic computer, would be of particular value for those who dealt with the creation of knowledge documents in a professional context:

Many writers and research professionals have files or collections of notes which are tied to manuscripts in progress. Indeed, often personal files shade into manuscripts, and the assembly of textual notes becomes the writing of text without a sharp break.

If a writer is really to be helped by an automated system [...] it should stand by him during the early periods of muddled confusion, when his ideas are scraps, fragments, phrases, and contradictory overall designs. And it must help him through to the final draft with every feasible mechanical aid—making the fragments easy to find, and making easier the tentative sequencing and juxtaposing and comparing. (136-7)

Following on from these observations, Nelson outlined a hypothetical framework for a computer based 'evolutionary file structure' that utilised a list metaphor in order to facilitate the rapid rearrangement of stored media artefacts, the 'Evolutionary List File' (ELF) (137-8). As envisaged, the ELF system would enable a reader to arrange and interconnect discrete units of electronically stored media in any way necessary for her organisational needs to be fulfilled, allowing her to rearrange subsequently the resulting file structures at an appropriate level of granularity as these requirements evolve over time. The experience of navigating this system would be akin to following multiply cross-referenced entries in an encyclopaedia, with the reader selecting from across the available links in order to actualise her own particular trajectory through the gathered material. Nelson termed the resulting matrix 'hypertext': 'a body of written or pictorial material interconnected in such a complex way that it could not conveniently be presented or represented on paper' (144).

Nelson's outline of the ELF architecture was predicated entirely upon harnessing the speed and flexibility of digital computing systems in order to arrange and present stored material in ways other than through static or hierarchical sequences—a capability he thought would be of value when organising resources whose conceptual links are either subject to constant revision or are primarily associative rather than taxonomic (136). In this regard, Nelson contrasted his vision of hypertext to any mechanism of information retrieval that was 'concerned with seeking *true* or *ideal* or *permanent* codes and categories'—an attitude that he considered to be 'fundamentally mistaken', arguing that because intellectual categories are always 'chimerical (or temporal) [...] our categorization systems must evolve as they do. Information systems must have built in the capacity to accept the new categorization systems as they evolve from, or outside, the framework of the old' (144). Nelson thus considered hypertext to be the most suitable means of articulating an ever-changing world, 'where relationships are unclear; where contingencies and tasks are undefined and unpredictable; [...] where things are in permanent and unpredictable flux. [...] And perhaps here, as in biology, the only ultimate structure is change itself' (144).

In the wake of his ground-breaking paper, Nelson spent the next four decades attempting to implement practically his ideas, albeit unsuccessfully. Nevertheless, his vision of hypertext influenced directly the scientist and engineer Tim Berners-Lee, who appropriated the term in order to describe the 'Hypertext Markup Language' (HTML) he developed so as to facilitate the standardised presentation and sharing of computerised documents in a networked environment, thereby establishing the technical basis for the modern World Wide Web.

5.1.2. *Storyspace*

The essential concept of hypertext, and its capacity to aid in the creation of manuscripts, was influential equally in the development of various interactive writing systems that predated the web, such as the *Storyspace* platform created by Jay David Bolter and Michael Joyce. *Storyspace* is of particular significance to the history of digital literature as an academically recognised genre in that it was used by Joyce to develop and present the first widely cited example of hypertext fiction, *afternoon, a story*, in 1987 (Rettberg). Distributed originally as a

means through which to demonstrate the capabilities of *Storyspace* to the wider public, both as a platform for authorship and as an environment for reading the works resulting, *afternoon* was soon considered to be a significant example of literary art in its own right, attracting a substantial level of scholarly interest (Rettberg). Standing in contrast with Nelson's vision of a system that attempts to generate clarity and understanding, the hypertextual dynamic of *afternoon* is predicated upon the use of links that yield different connections depending on those explored previously by the reader—the aim being to disrupt her ability to access certain parts of the work, and so presenting her with a challenge mirroring that of its protagonist, who is struggling to uncover the truth behind the possible deaths of his estranged wife and child.

The critical success of *afternoon* and its accompanying *Storyspace* environment led to other works of hypertext literature being authored, such as Stuart Moulthrop's *Victory Garden* (1991), which explores the cultural impact of the 1991 Gulf War through a matrix of television transcripts, letters, academic citations, song lyrics, poetry, and symbolic graphics—structuring these fragments in such a way as to accommodate a variety of reading strategies. Shelley Jackson's *Patchwork Girl* (1995) is another early hypertext that has been the subject of much critical discussion in the years following its initial publication, offering a potent rewriting of Mary Shelley's *Frankenstein; or, The Modern Prometheus* (1818) by featuring a female monster and drawing myriad comparisons between her existence as a patchwork of different body parts and the fragmentary body of the hypertext in which she is articulated, using this association to explore questions concerning the relationships between the materiality of the body and the materiality of writing in a digital environment.

Alongside these fictional works, *Storyspace* was employed by a number of scholars who were interested in publishing academic work using the hypertextual form in order to facilitate the exposition of their critical enquiries. One such text is *Socrates in the Labyrinth: Hypertext, Argument, Philosophy* (1994) by the philosopher David Kolb, which constitutes a self-reflexive investigation into the relationship between the practices underpinning philosophical discourse and those involved in navigating hypertext—seeking to define how the relations between thought, argument, and exposition can take on new characteristics when articulated creatively through the structures of hypertext. *Socrates in the Labyrinth* offers an early example of the type of digital text that is being examined

in this chapter, as an instance of scholarly work in which the digital medium and the output forms it makes possible constitute an integral aspect of the critical investigation. Kolb himself outlined a number of the ways in which different argument structures could be mapped onto those of hypertext, ranging from relatively 'linear' forms—conventional essays linked to supplements and expansions—to those with 'multilinear' structures—essays with divergent argument pathways—before concluding with structures consisting of either fragmentary pathways or encompassing a broad spectrum of alternating perspectives (Brent). Each of these varying possibilities do not represent simply different modes of communicating philosophical discourse, but embody a range of conceptual trajectories at the level of their articulation. Kolb's text can thus be considered to enact heuristic principles that are shared with contemporaneous works of hypertext fiction, being concerned with the experimental actualisation of different possibilities of form and content within the space of the digital medium—a blurring of the conventional distinction between creative and critical work that will be seen repeatedly throughout this chapter.

As this diverse collection of texts illustrate, the *Storyspace* model of hypertext was significant for its pioneering of a standardised environment in which many different works could be authored and distributed. Moreover, it provided a stable foundation upon which otherwise disparate groups of writers, artists, and academics could congregate, and thus form one of the key points of emergence for the modern community that supports the creation and study of digital literature (Rettberg). Operating at a time before the World Wide Web presented digital writers with an accessible mechanism for authoring and distributing new works, the *Storyspace* environment facilitated the creation of a common set of reference texts that could be accessed and discussed by a wider audience (Rettberg).

Eventually, this particular community, based around the idiosyncrasies of a particular software platform (the 'Storyspace School') would lose much of its early predominance with the advent of the new authoring technologies afforded by the modern web environment (Rettberg). Nevertheless, its legacy of championing digital textuality as a topic worthy of academic study can be witnessed in current efforts to undertake the cataloguing of new works and the creation of dedicated online knowledge bases—as conducted by groups such as the 'Electronic Literature Organisation' (ELO) and 'Electronic Literature as a Model of Creativity and Innovation in Practice' (ELMCIP).

5.1.3. *Vectors*

As this short genealogy indicates, the technical and conceptual matrix from which digital literature has emerged is bound up with the development of information architectures for the management of electronically stored materials. The legacy of pioneers such as Bush, Nelson, Bolter, and Joyce in fostering the performative potential of the genre can be discerned in how the technical systems they developed were predicated upon a contingent, processual model of human knowledge—as a matrix of connections subject to revision and transformation as part of an adaptive process of being within an ever changing environment. The significance of this vision lies in its recognition that representational abstractions are insufficient to predict and foreclose the world’s contingencies, with observable phenomena being irreducible to acts of human perception, knowledge, and action, and so refusing to be rendered entirely knowable and controllable. This recognition opens a pathway towards acknowledging the agential influence of nonhuman formations, technological structures included, in giving shape to human engagements with the observable world, and thus, as a legitimate component of the processes of knowledge-making—a point advocated throughout the previous chapters by scholars such as Andrew Pickering, Jerome McGann, and Bethany Nowviskie, who consider how these nonhuman influences can be harnessed creatively to facilitate progressive, nonmodern modes of knowledge-making practice. It is this entangled vision that forms the basis of how this chapter will be approaching scholarly texts in which the digital medium forms a key aspect of the critical vectors being articulated.

To explore these key points in further detail, it can be noted that Bush envisioned the Memex as not simply a tool for enabling the convenient storage and rapid traversal of divergent materials, but as a means of facilitating human enquiry by allowing the rapid restructuring of extant assemblages of observation and evidence in response to novel developments. From a performative standpoint, the Memex can be understood as a mechanism that models human knowledge-making as an adaptive practice, with the system’s capacity to establish arbitrary connections being a reflection of the open-endedness of the world’s potential unfolding. Representational knowledge is depicted consequently as being subordinate to the practices of coping with this potential, rather than as

constituting an immutable model through which the world's becoming can be encapsulated and pre-empted.

Nelson's vision of hypertext was premised similarly on a depiction of knowledge as an adaptive system embedded within an unpredictable, ever transforming environment, as opposed to a Cartesian formation that stands apart from the observable world. Bolter and Joyce's subsequent presentation of *Storyspace* can be understood in turn as echoing these earlier visions of Bush and Nelson. In an article tracing the developmental history of *Storyspace*, philosopher of technology Belinda Barnet has observed that one of the key motivations for Joyce in developing the system was a desire to bring the myriad acts of creative association involved in writing a text to the reader's own experience:

What I really wanted to do, I discovered, was not merely to move a paragraph from page 265 to page 7 but to do so almost endlessly. I wanted, quite simply, to write a novel that would change in successive readings and to make those changing versions according to the connections that I had for some time naturally discovered in the process of writing and that I wanted my readers to share. (qtd. in Barnet)

Barnet notes subsequently that *Storyspace* carries the legacy of previous hypertextual visions in expressing a particular model of the human mind—albeit one that is oriented towards the authorial processes from which a text emerges. To extend Barnet's observation in terms of those outlined in previous chapters, *Storyspace* can be viewed as attempting to rearticulate some of the key material aspects involved in the performances of writing and redrafting a text—of the physical rearranging of different excerpts, as Joyce himself noted, and the emergent dynamics of juxtaposition and recombination that exposes or suggests new possibilities for meaning within developing textual structures. Stated more simply, *Storyspace* operates on the premise that the practices of crafting a textual artefact can be defined as much in terms of the material vectors guiding its composition, and the provocative, unplanned emergences that can result, as the conscious agency brought to this process by the author—a point Nelson emphasised similarly when describing the capacity of the ELF system to aid in the creation of manuscripts (137). It is these nonhuman agents of inscription that

are carried through the mechanical operations of the *Storyspace* environment, which affirms their status as legitimate participants in human intellectual practice.

As contended throughout the previous chapters of this thesis, it is these entangled vectors binding the intellectual and the material, the human and the nonhuman, that are enacted and made visible by digital literary texts, whose medial structures can be understood as a key source of agential provocation within the space of the performative encounter with the reader. It is this explicit engagement with the material performances that are shaping the contemporary digital world that enables these artefacts to redeploy creatively these same phenomena in such a way as to explore their key functional predicates, the culturally contingent assumptions underpinning them, and the possible ways these structures might be reoriented along more progressive vectors.

It is from this standpoint that academic works of *Storyspace* non-fiction, such as *Socrates in the Labyrinth*, can be viewed as pioneering demonstrations of how the performative relations between the medium, form, and content within a digital publishing environment can be deployed creatively for critical purposes. Although the later development of the World Wide Web has furnished the international scholarly community with an unprecedented platform for communicating, exchanging, and archiving the latest research, contemporary journal websites often work to place the technology into a utilitarian relationship with human needs—as a tool of facilitating access to scholarship, rather than a means of redirecting and disrupting the agency of the researcher in order to foster the kinds of unintentional developments that scholars such as Pickering, McGann, and Nowviskie consider to be intellectually provocative. Scholarly digital texts that facilitate and utilise these kinds of performative exchanges thus occupy a very particular technocultural niche, but are valuable nonetheless because they can function as catalysts for enquiry into the full potential of ‘born digital’ scholarship. These texts thus provide a suitable closing case study for a performative analysis of digital literature, developing the observation that it enacts alternative modes of knowledge-making using examples that are engaged explicitly in the task of deploying these modes for critical purposes.

A significant repository of scholarly digital texts with a strong performative dimension can be found in the online journal *Vectors: Journal of Culture and Technology in a Dynamic Vernacular*. Launched in 2005, *Vectors* represents a

long term effort at facilitating new forms of digital academic publishing—a vision that is made clear in the journal’s introductory statement:

Vectors maps the multiple contours of daily life in an unevenly digital era, crystallizing around themes that highlight the social, political, and cultural stakes of our increasingly technologically-mediated existence. [...] This investigation at the intersection of technology and culture is not simply thematic. Rather, *Vectors* is realized in multimedia, melding form and content to enact a second-order examination of the mediation of everyday life. [...] *Vectors* doesn’t seek to replace text; instead, we encourage a fusion of old and new media in order to foster ways of knowing and seeing that expand the rigid text-based paradigms of traditional scholarship. Simply put, we publish only works that need, for whatever reason, to exist in multimedia. (McPherson et al., “Introduction”)

Scanning through the *Vectors* archives, the reader is confronted by a rich body of experimental work in this regard, covering a wide range of critical themes and demonstrating myriad interface systems for structuring the reader’s access to diverse multimedia outputs. Collectively, the works published within *Vectors* represents an attempt at crystallising the potential for the functional, behavioural, and expressive capacities of digital publishing technology to communicate creatively the critical assemblages of scholarly thought and practice.

To illustrate briefly the variety on offer, in the Winter 2007 ‘Perception’ issue, Anne Friedberg, working with designer Erik Loyer, presents “The Virtual Window Interactive”, which examines the technologies of vision from the Renaissance to the present—allowing the reader to juxtapose various framing apertures, from stained glass windows to iPod screens to cinematic projections, with different visual contents, comparing and contrasting these varying intersections so as to evaluate the viewing assumptions built into each. Another example can be found in the Fall 2006 ‘Ephemera’ issue, where Melanie Swalwell, again with Erik Loyer, presents “Cast-offs from the Golden Age”, which tasks the reader with investigating the history of video gaming in New Zealand by navigating a fragmentary body of materials scattered across a virtual archival space, making notes and drawing together the different vectors of her journey to produce an idiosyncratic account of this largely unexplored domain. As a final illustration, in

the Summer 2012 'Memory' issue, Mark Hansen, working with designers Raegan Kelly and Michelle Menzies, offers "*shi jian*: time", an exploration of how databases of digital media shape modern conceptions of temporality—allowing imagery from the author's visit to Beijing to be organised and sequenced along various parameters so as to enact diverse temporal trajectories, interrogating the framing of recorded experience by digital systems.

As the journal's introductory statement makes clear, these varied exercises are not seeking to present a technical and ideological dichotomy between the traditional primacy of written scholarship versus alternative output forms, or indeed the agency of print compared to that of digital multimedia—although the latter is able nonetheless to support animated visual forms, audio emissions, as well as architectures of access that are more directed than the open entryways afforded by the printed codex. Instead, the goal is to explore how the technologies, conventions, and possibilities of digital inscription can shape the forms of knowledge-making they articulate and sustain. As considered throughout the previous chapters regarding the *Electronic Literature Collection*, these effects manifest not only in the ways that different output sequences can be juxtaposed with one another, revealing them in light of different contexts, but also through the processes by which the reader navigates and assembles these sequences, as well as by how the digital medium affects the overall context in which different vectors of scholarly thought are received and interpreted. Although many writing and publishing decisions in a digital environment are subject to the constraints imposed by prevailing devices and infrastructures—in terms of their structuring around standardised formats and the paradigms of cursor, keypad, and screen—*Vectors* still offers a glimpse into how the functional and cultural aspects of digital technology might be engaged creatively so as to be rendered of explicit critical significance to the scholarly work being conveyed, rather than being utilised solely at the level of distribution and access.

The *Vectors* archives prescribe no singular template for how this integration between digital technology and scholarly exposition might be developed or enacted, or indeed what it might represent ultimately—allowing it to be crystallised idiosyncratically within the space of the individual works and leaving the reader free to evaluate the success of the resulting experiment. Nevertheless, in looking back at the genealogy they share with hypertext information architectures, and the performative worldview that informed them, the question

arises as to how these aspects are carried through succeeding technologies and the digital forms they enable. In order to tackle this question, and so develop further this chapter's primary contentions regarding performative scholarly texts, the discussion will turn now to evaluating in detail two published works from the *Vectors* archives. The first text is "Narrating Bits: Encounters between Humans and Intelligent Machines" by N. Katherine Hayles, which was published initially in the Autumn 2005 'Evidence' issue. The second text is "Programmed Visions" by Wendy Hui Kyong Chun, published in the Autumn 2007 'Difference' issue. These two texts have been selected for analysis as their particular combination of formal and thematic attributes work to reflect closely on the entanglement of human and nonhuman agency as part of a performative knowledge-making process, and so provide a suitable platform for exploring the greater implications of this vision for scholarly work and how it can be approached and understood in turn.

5.2. "Narrating Bits"

5.2.1. Form

In the editor's introduction to "Narrating Bits", Hayles' text is described as an attempt at rearticulating the relations between form and content within academic criticism, exploring whether digital systems can facilitate the presentation of scholarly work as 'a space of possibility, inviting accident, play, and mutability' (McPherson et al., "Narrating Bits: Editor's Introduction"). Derived originally from a text presented in a conventional essay format—which can be downloaded and viewed separately—"Narrating Bits", developed in collaboration with Erik Loyer, is described as seeking to preserve both the structural flow of Hayles' argument whilst affording 'the possibility for juxtaposition, interactivity, and collision' by facilitating multiple points of access. "Narrating Bits" achieves this end through a number of specific interface structures that are illustrated in fig. 25 (see page 169). As indicated by these two screenshots, the interface of Hayles' text is arranged along both the horizontal and vertical axes—with the former being a row of contiguous orange icons and the latter an alphabetical list of keywords. Clicking the orange icons along the horizontal interface axis yields specific paragraphs of Hayles' essay and their associated footnotes. These icons thus represent each

Narrating Bits, by N. Katherine Hayles

keywords / help

- agency
- algorithm
- ambiguity
- capacious
- causality
- combinatorics
- competition
- complex ecology
- construction
- content
- cooperation
- culture
- database
- desire
- dialogue
- distortion
- Donald Rumsfeld
- Dreamscape

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Narrating Bits, Mark Hansen?
posted by Time and Narrative to ambiguity
May 16 2006

keywords / help

- agency
- algorithm
- ambiguity
- capacious
- causality
- combinatorics
- competition
- complex ecology
- construction
- content
- cooperation
- culture**
- database
- desire
- dialogue
- distortion
- Donald Rumsfeld
- Dreamscape

+ add comment

Narrating Bits: Encounters between Humans and Intelligent Machines

One set of problems arises from slippages in the way Manovich deploys the term "database." His initial usage references database in its technical sense: "database is defined as a structured collection of data. The data stored in a database is organized for fast search and retrieval by a computer and therefore, it is anything but a simple collection of items" (218). As his argument progresses, however, he moves from this technical definition to a much broader sense of the term, as when he acknowledges that "not all new media objects are explicitly databases" (221), but he nevertheless treats them as such by conflating databases with "data structures" (223). The ambiguities deepen when he announces that "as a cultural form, the database represents the world as a list of items, and it refuses to order this list" (225), a characterization at odds with his earlier

1. In her study of database textbooks over the last quarter century, Sarah Richardson makes this observation: "The 1977 text [James Martin, *Computer Data-Base Organization*] teaches theory that has not yet been realized beyond specialized applications and opines about the larger importance of the database in the future tense. The 2002 text [Connolly and Begg, *Database Systems*], in contrast, addresses an audience whose world is so imbued with the

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Fig. 25. The horizontal and vertical interface axes of "Narrating Bits".

of its sixty-four constituent paragraphs in order, which can then be followed either by clicking through each one in turn, or by selecting an arbitrary point along the axis. Also apparent is the integration of comment boxes that are assigned to each paragraph, allowing the reader to publish her own response to particular aspects of Hayles' argument for the benefit of a wider reading audience.

The list of keywords that constitutes the vertical interface axis of "Narrating Bits" provides another approach towards navigating the essay, one that enhances further its ability to function as a space in which various recombinant

possibilities may emerge. Each keyword is associated with a number of different paragraphs, and this gives the reader the option of selecting her desired keyword and following the resulting trail. As shown at the bottom of fig. 25, an orange line is drawn connecting the selected keyword to various points along the horizontal interface axis, and this provides a graphical representation of where it has been assigned over the course of Hayles' essay. Additionally, whenever the reader places her cursor over individual entries in the keyword list, a 'ghost' line appears that highlights temporarily these associations.

The cumulative effect of these particular interface structures is to invite the reader to explore Hayles' essay through a selection of different viewing sequences, comparing and contrasting different paragraphs with one another whilst applying the conceptual lenses suggested by different keywords. It is this articulation of the essay as a mutable space of possibility that expresses the principal tenet of Hayles' argument in "Narrating Bits", which is to recast the debate surrounding the expressive potential of digital multimedia in terms that move beyond the critical dyad of 'narrative' versus 'database' established by Lev Manovich in *The Language of New Media* (2001).

5.2.2. Content

In her initial summary of his position, Hayles observes that Manovich defines digital multimedia in terms of its structural reliance upon databases of stored material, to which he claims subsequently that 'as a cultural form, the database represents the world as a list of items, and it refuses to order this list' (qtd. in "Narrating Bits"). Hayles notes subsequently that this characterisation of database architecture places it into a 'competitive' relation with Manovich's particular understanding of narrative—as a form whose complex interdependencies preclude it from having any structural relations with the arbitrary mutability of the database. That is, the narrative emphasis on causality, agency, and temporal progression as a means of expressing observable phenomena stands in contrast with the database ontology of discrete list entries, whose strengths of rapid expandability and modular flexibility run against the carefully tuned assemblages that constitute a typical narrative formation.

Hayles' own understanding of the constituent structures and relations between narrative and database diverges from Manovich's account on a number

of points, but she bases her critique in particular on the specific qualities of databases as technical phenomena, and how their relationship with human agents can be understood as a consequence:

No sooner is a database established than users discover its limitations, for it allows searches only according to the specified parameters, and users invariably discover other ways in which they want to interrogate the data in ways impossible with the given database form.

Although humans design and build databases, databases are brought into the world as artifacts through technologies of data compilation, storage, transmission and retrieval, which have their own constraints and possibilities deeply affecting how databases are built. [...] One way to look at the contemporary database, then, is as a site where the encounter between humans and intelligent machines is performed and enacted in precisely defined ways [...] The database is a cognitive framework for dialogue between its two parents, a staging ground where two very different modes of thought interact, sometimes productively, sometimes with frustrating miscommunication and inefficiency.

As suggested in these two passages, Hayles envisions databases as staging a dialectic between the striated logics that underpin its constituent technical matrices—the specific constraints, functional rules, and the assumptions underpinning these rules—and the emergent behaviours of the greater agential environment in which they operate—an exchange that can evolve along myriad possible vectors. Hayles elaborates subsequently on her depiction of the constraints and abstractions underpinning database logic by noting that it expresses only information that is fully delineated, ‘known’, as opposed to that which is possible, ‘known unknowns’, and emergent forms whose potentialities are unforeseen entirely, ‘unknown unknowns’.

It is in light of these observations that Hayles develops an alternative framework through which to acknowledge the varied interrelations between human knowledge-making and its articulation through digital multimedia, replacing the very particular concept of ‘database’ with the more expansive

'possibility space', which is more amenable to being understood from a narratological standpoint:

A more capacious term, possibility space, allows room for all three of these epistemological categories. In a narrative context, knowns correspond to the content of the narration. Known unknowns refer to outcomes possible within the world the narrative delineates but not articulated within a given narrative. [...] Unknown unknowns refer to possibilities that could appear within a narrative system but are neither explicitly articulated nor anticipated as possible outcomes. Any narrative system capable of generating emergent phenomena can create unknown unknowns, for the very idea of emergence implies that the interaction of multiple agents and components can result in unanticipated behaviors at the global level that can not be predicted from the parts alone.

Hayles thus undercuts Manovich's implied dualism between database and narrative by suggesting that in most instances of digital multimedia, possibility space constitutes a more nuanced term through which to delineate the conceptual structures they express through their mechanical operations. Moreover, following her description of the relations between databases and their human users, Hayles outlines the relationship between narrative and possibility space as an interface between the human and nonhuman domains. Whereas narrative space facilitates human interaction with the world, charting a range of possible outcomes and their causes, the possibility spaces of digital systems carry 'the scent of the non-human, the algorithmic, the procedural, the machinic' by combining and juxtaposing rapidly different units of recorded information in such myriad ways as to present a space 'in which a large number of unforeseen variants, events and outcomes can arise'. Artefacts that express these emergent possibilities, algorithmically unearthed over time, include certain manifestations of digital art and literature—notably the explicitly 'generative' forms discussed in the previous chapter—as well as advanced simulation technologies. For Hayles, this intersection of human agency and perception with the nonhuman potentialities of digital machines affords an unprecedented glimpse into the emergent dynamics of material existence: '[Possibility Space] can be understood as opening the human to the unthought and unrecognized otherness of a

universe much bigger than human conception can hold. This is the promise of emergent adaptive simulations—that we can program our machines to create what we ourselves did not conceive as such.’

It is in light of these remarks that Hayles concludes *Narrating Bits* by justifying the conversion of her critical narrative into an alternative digital format, seeking to establish it as a mutable possibility space that facilitates the emergence of new interpretative angles on her work, and which catalyses entirely new vectors of thought in the process: ‘a kind of playing field on which many different games may be played and (more significantly) different *kinds* of games can evolve.’

5.2.3. Practice

Hayles argument, and its articulation in digital form, resonates with a number of the key themes explored throughout this thesis. In describing the intersection of human and machine as a reciprocal exchange of agency—coming together ‘sometimes productively, sometimes with frustrating miscommunication and inefficiency’—the language and focus of Hayles’ efforts in “Narrating Bits” carries a resonance with Andrew Pickering’s characterisation of the performances that articulate scientific research and engineering practice—of the acts of resistance and accommodation between human and nonhuman agencies from which knowledge of the world is specified and sustained. This comparison with the work of Pickering can be noted especially in Hayles’ emphasis on the emergent outcomes that such exchanges of agency can yield, facilitating the kinds of unpredictable behaviours and processes whose resistant materiality is both provocative and illuminating conceptually, revealing a world whose richness of possibility is far greater than any given framework can predict or contain.

In terms of how these performative dynamics intersect with specific practices of critical thought and scholarly writing, it is also possible, as with the work of Pickering, to relate these aforementioned vectors of Hayles’ argument to the experimental criticism of Jerome McGann and Lisa Samuels, who draw on the contingent ontology characterising all textual phenomena in order to conduct deformative modes of literary analysis—modifying systematically the formal attributes of specific texts so as to evaluate the structures through which their possibilities of meaning are made manifest. Stated more directly, Hayles interest

in the fusion of critical work with the combinatory functions of digital possibility spaces can be understood as harnessing the nonhuman agency exhibited by the latter in order to collate and juxtapose different aspects of the former. These manoeuvres take place at speeds and scales beyond the native capacities of the reader, fostering the disruptive contrasts necessary for new interconnections to be considered between different critical threads, and so establishing the conditions for new perspectives on the argument as a whole, as well as suggesting potentially new vectors of thought entirely. In “Narrating Bits” this dynamic manifests through interface structures that enact self-reflexively the principals it describes, providing the reader with the procedural tools necessary to deform systematically the essay structure in order to evaluate for herself the critical potential of Hayles’ argument. An example of this can be found in the use of threaded keywords as a means of navigating the text, which function as a mechanism for both enacting and observing the changing contexts of reception that emerge from these deformances. That is, when the text is actualised and explored through the pathways provided by ostensibly stable keywords, jumping from one fragment to another, comparing and contrasting, the reader is afforded a point of reference from which to evaluate how, as the usage of a particular keyword changes, the wider textual field, and the conceptual webs it supports, are transformed within the space of her performative dialectic with the text.

These operations illustrate concurrently the role of nonhuman agency in shaping the practices of human knowledge-making, and suggest in turn the basis for a progressive critical practice using digital systems. On this point, “Narrating Bits” offers initially an echo of Nelson’s vision of an electronic archive that functions not as a fixed database of abstract concepts, representing a stable and knowable domain, but as a tool of adaptive knowledge-making in the context of an ever changing and indeterminate world. In such an environment, where material performances exceed regularly the descriptive powers of representational primitives, the medium itself, and the formal structures it supports, can exercise an explicit heuristic function: enacting in specific ways the concepts under discussion, and so demonstrating, at a small-scale, the processes that enable them and the practices they give rise to. The functional and conceptual principals that structure “Narrating Bits” are suggestive of a form of critical practice that is appropriate to a world whose observable properties unfold emergently through the performative entanglement of different energies

and materials, with knowledge gaining its value not in the abstract, but in relation to the exchanges of agency that specify and sustain particular configurations of the world's becoming. Stated alternately, "Narrating Bits" constitutes a self-reflexive critical effort that does not harness simply the capacities of digital computing to facilitate the convenient storage and rapid transmission of recorded knowledge, but to expose and explore these structures as a key context of reception for the outputs they make available—both at the level of the text itself and the greater digital infrastructures in which it is embedded. In the case of the latter, "Narrating Bits" performs Hayles' broader argument concerning how digital systems can function as a source of productive agential constraint, for in delimiting certain forms of human critical and practical agency so as to suit better the technical requirements of the medium—such as the fixity of navigable pathways offered by electronic databases—they provide a catalyst for creative responses towards these very limitations in ways that can enact new possibilities for engaging and understanding the world. Hayles' text is an example of one such response, pairing the rigid matrix of information storage architecture with an interface that capitalises on its capacity to retrieve and display different items with great speed, creating a possibility space that yields the kinds of emergent insights that Hayles views as opening the human mind out towards the greater nonhuman domain of which it is part.

5.3. "Programmed Visions"

5.3.1. Form

Developed in collaboration with Raegan Kelly, Wendy Hui Kyong Chun's "Programmed Visions" is described in the editor's introduction as an archival work that both resists and disrupts any predetermined conception of an archive that the reader may hold initially (McPherson et al., "Programmed Visions: Editor's Introduction"). Observing that contemporary digital archives articulate privileged notions of 'transparency, accessibility, standardization, interoperability, and ease of use', "Programmed Visions" is described as working instead to undermine these expectations at numerous intersecting levels of form and content:

As the reader begins to navigate, traditional expectations of the cursor's effect are frustrated and denied. Text shifts and emerges via an internal logic that confounds our epistemophilic desires. Historical texts, scientific treatises, legal documents, excerpts of theory, and snippets of fiction all collide. Quotes are cut off, sources are unclear, everything's a bit opaque and chaotic: all in all an archivist's nightmare. Clicking the blue triangle [in the corner of the screen] reveals a map of sorts, but there is no easy transit from this overlay to the data 'below.' By segregating the macro from the micro and divorcing the detail from the overview, the piece frustrates our expectations of digital media. (McPherson et al., "Programmed Visions: Editor's Introduction")

In the introductory screen that greets the reader upon loading the archive, Chun explains that the key problematic driving these resistive interface strategies is the extent to which racial categories can be understood as emerging from, and being sustained by, intersecting archival resources—as well as providing in turn the ontological justification that makes archives possible, as a discourse that underpins the processes of comparison and contrast between various materials, and justifies the identification and categorisation of their essential differences. In the specific case of the digital archive, Chun goes on to describe how she is interested in exploring 'the importance of race to the logic and practice of scientific, technological and cultural discourses', and thus indicates that "Programmed Visions" works to articulate these interlinked questions as part of a meditation on its very being.

In order to investigate how the formal characteristics of Chun's archive critique the varied relations between racial discourse and archival technologies, it can be observed initially that Chun's opening remarks designate themselves as occupying the position of '0, 0, 0' within the mathematical space defined by the archive's software architecture—a point that she elaborates subsequently:

Mathematically speaking, an origin is a "fixed point from which measurement or motion commences" (OED). Since the project uses Cartesian coordinates, the origin is the point of intersection (0,0,0) of the three axes. However, given that databases designate the first column and

row as 0,0, rather than the center row and column, the mathematical origin of this project is its middle: 6,6,0.

Chun's description here suggests that although the archived materials constituting "Programmed Visions" are treated computationally as a series of lists in two dimensions, their interface structures have been arranged so that the reader must navigate the database along three interlinked axes (X, Y, Z). For this end, the reader is presented with two primary interface mechanisms, both of which operate in tandem. The first involves simply clicking on any items that are visible currently (see fig. 26, page 178), whereupon a keyword appears in the middle of the screen—such as 'technology', 'culture/nature', 'identification', 'difference/sameness', 'race' etc.—which is then followed by the reader's perspective being shifted so as to occupy another set of spatial coordinates within the archive, presenting a fresh set of materials associated with these keywords. Unlike a conventional hypertext, the linking strategy of "Programmed Visions" exhibits little in the way of a traceable pattern, for selecting the same item will, almost invariably, result in the appearance of a different keyword and a transition to a different location within the archive. This has the effect of making it impossible to infer the logical paths enacted by the software architecture of "Programmed Visions" using empirical strategies alone.

Adding to the difficulties of navigating the archive is the unconventional presentation of the materials it makes available, with numerous items being scattered across the available viewing area and often exceeding its boundaries so that only small portions are readable at any one time. Indeed, as hinted in fig. 26, it is often the case that these items will overlap one another, with some receding into the background, hidden partially by the layers above. It is this characteristic that articulates most perceptibly the three-dimensional architecture of the archive, with its various materials being connected not simply along the X and Y axes, but also being stacked in layers along the Z axis. Nevertheless, the lack of any specific interface mechanism for traversing these various layers ensures they can be accessed only when a keyword connects to an item residing in a layer different from that which is being viewed currently.

The key consequence of this arrangement is that it is difficult to gain a clear sense of the archive's structural configuration, a point which is compounded when



Fig. 26. Typical views of the archival materials within "Programmed Visions".

using the second key interface mechanism available to the reader: the 'archive overview & re-navigation' screen (see fig. 27, page 179). Although it resembles initially a graphical overhead representation of the archive, revealing the global spatial arrangements of its constituent materials, even a cursory glance reveals the existence of multiple layers of items receding behind the uppermost surface—their visibility depending on where the reader finds herself within the archive at

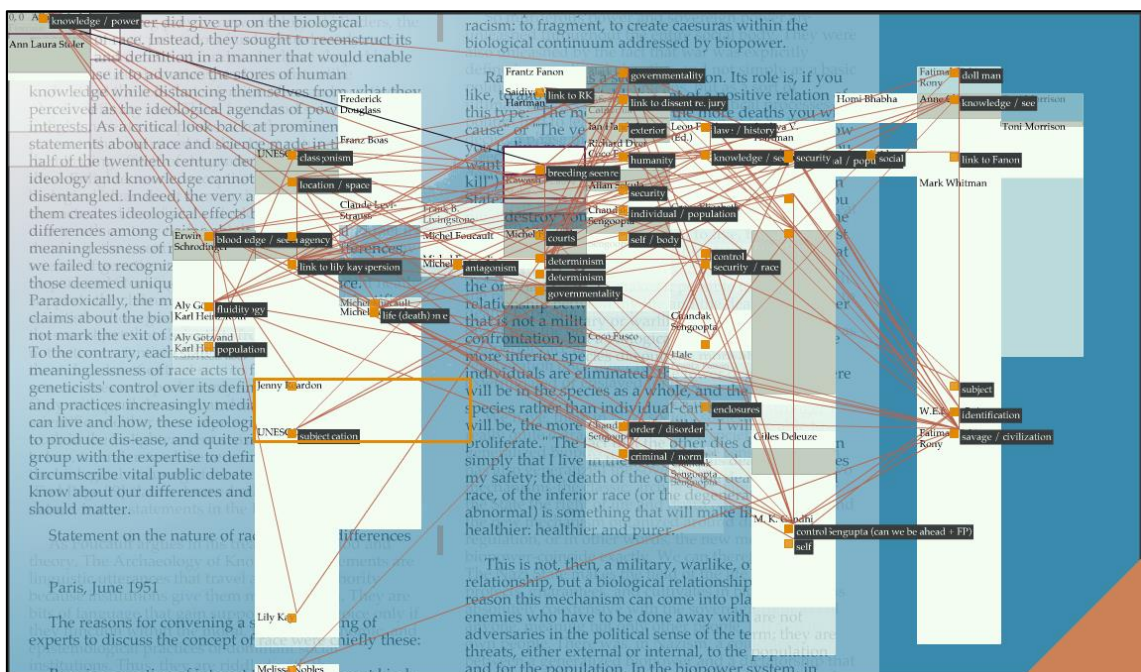
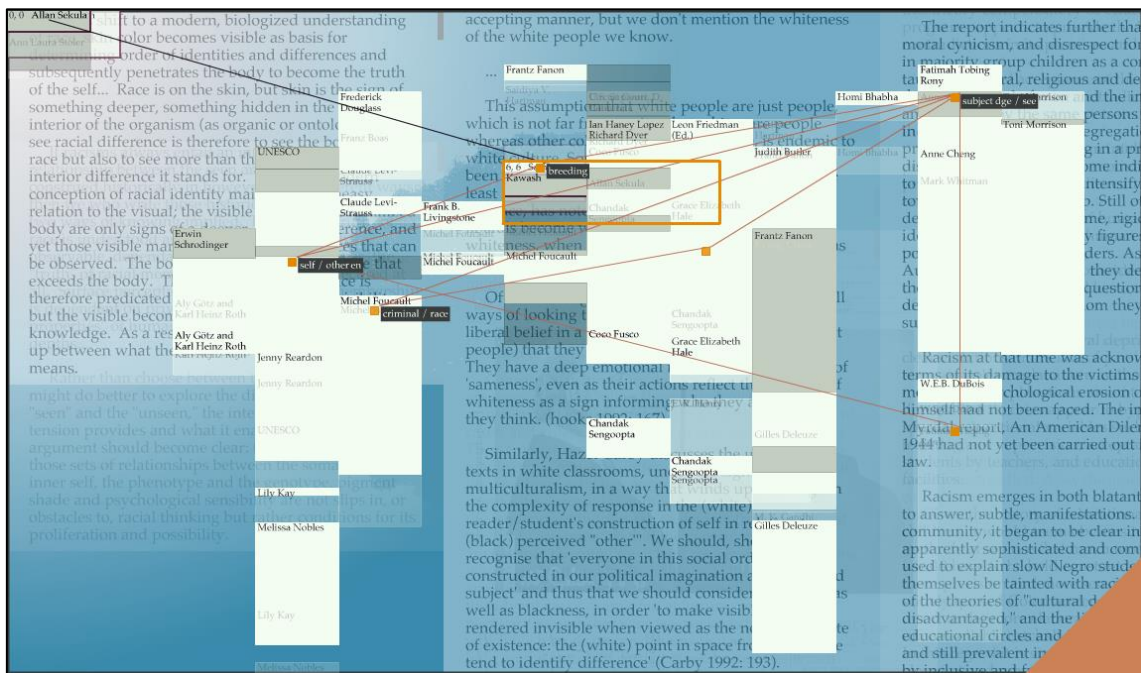


Fig. 27. Typical views of the 'archive overview & re-navigation' screens. The orange rectangle indicates the reader's current field of view in relation to the rest of the archive.

any given moment. Furthermore, the map itself becomes obscured gradually as the reading encounter develops, for the system records the particular vectors of the reader's traversals as a growing web of intersecting lines, labelling these using the keywords generated at each location.

5.3.2. Content

Reflecting the complex and unpredictable mechanisms through which the archive is interfaced by the reader, the constituent materials of “Programmed Visions” are a sprawling matrix of divergent items that articulate different facets of the social, cultural, technological, and scientific means by which racial difference was identified, sustained, and resisted historically. These materials include excerpts from Michel Foucault’s *History of Sexuality* (1990); UNESCO reports from the 1960s written by Claude Levi-Strauss; late nineteenth century writings on eugenics by Francis Galton and Charles Davenport; a philosophical reflection on Logic written by Gilles Deleuze; passages from *Black Skin, White Masks* (1952) by Frantz Fanon; excerpts from Toni Morrison’s novel *The Bluest Eye* (2000), along with a critical analysis of the text by Anne Cheng; a ten point political manifesto by the Black Panthers; early photographs of racial segregation; a tract on the materiality of cellular life by the physicist Erwin Schrödinger; reflections on the nature of archives by Jacques Derrida; and various court rulings from the United States in the early 1900s upholding discriminatory racial policies. Arranged according to a logic that is obscured entirely from the reader, these materials are neither contextualised individually, nor in relation to one another, by way of any accompanying commentary.

5.3.3. Practice

There are many potential approaches for considering the relations between these diverse materials, the questions of racial difference that Chun wishes to engage, and the digital architecture of her archive. As was observed initially by the *Vectors* editorial staff, the defining characteristic of “Programmed Visions” is the way in which it challenges the paradigms of ‘transparency, accessibility, standardization, interoperability, and ease of use’ that characterise the functioning and presentation of modern digital archives. Deploying Pickering’s model of the performative dialectic between the human reader and the nonhuman digital artefact, it can be observed that the concrete resistances exhibited by “Programmed Visions” against these paradigms both reveal and reorient the material powers of the archive as specifying a fixed way of knowing both the subject at hand and the world in general. That is, the resistances presented by

the archive against the reader's traversals enacts a critique of the naturalised intersection of the material, the technological, and the cultural in structuring the shared ontological imperatives behind the founding of archives and the establishment of racial difference, suggesting alternative modes of knowledge-making in the process. Here, the very structure of "Programmed Visions" undermines any notion that classificatory systems are founded on an essential body of differences which can be then evoked, arranged, and encapsulated neatly within conceptual abstractions and atemporal laws—the founding paradigms of the representational idiom. Presenting instead a scattered body of disparate, often contradictory items, organised and accessed according to principles that are largely indiscernible from the reader's perspective, the relationship between form and content in Chun's archive expresses an alternative vision whereby difference, racial or otherwise, becomes an enacted rather than absolute phenomenon—a performance crystallised and sustained through the intersection of multiple material agencies and practices, liable always to be transformed or to unravel with each passing iteration.

To delineate the above reading in greater detail, it can be reiterated how the reader is confronted with a matrix of divergent materials that she is unable to traverse at will, or perceive in full, and whose idiosyncrasies she must negotiate and reinterpret continually in the face of the unpredictable behaviours it yields against her attempts at understanding. In navigating "Programmed Visions", the reader is deprived of the visible, overarching categorisations that give shape to traditional archival assemblies, and thus any indication of a greater underlying system that implicates particular classificatory arrangements—which function not simply to facilitate access, but to specify certain properties deemed essential to the subject at hand. The reader is thus confronted with the task of relating for herself the myriad items she might encounter over the course of a particular reading session—to re-consider them in light of previous and newly revealed materials, and so establish her own particular array of casual or conceptual links. Stated succinctly, the reader has to assemble her own provisional structures of categorisation, subject to constant revision as the reading encounter evolves.

These processes of negotiation between diverse materials have the principal effect of articulating the mutability of race as an emergent rather than an essential concept, for the reader, lacking any transcendent frame of understanding imparted by an extant categorical system, has to consider

independently how various historical discourses, present across myriad scientific, legal, and social domains, converged so as to delimit the grounds upon which particular notions of racial difference could be justified, maintained, and then resisted. That is, the uncertainties involved in relating together the disparate, often contradictory materials of the archive enacts the very lack of stable ontological structures that can be used to articulate racial difference as an essential, unchanging reality. Consequently, the reader is encouraged to reflect on how these processes of comparison and contrast between the selected materials operate to produce such effects—the particular logics and conventions behind the selection and classification of observable features that are deemed markers of essential difference as compared to those indicating commonality. Here, the capacity of digital hyperlinks to yield unexpected combinations and juxtapositions—of the kind that Nelson, Joyce, and Hayles saw as offering powerful sources of creative insight—functions as a means of challenging the reader’s attempts at assembling a coherent understanding of her traversals, forcing her to question and to re-evaluate the assumptions underpinning the methodologies she employs, prior to considering how they influence subsequently her conclusions. This radical questioning is a key goal of “Programmed Visions”, which seeks to deconstruct not only the very notion of racial difference, but to explore its role as an enabling paradigm through which the establishment of difference between observable phenomena is made possible, as Chun explains in her opening statement:

Examining the importance of race to the logic and practice of scientific, technological and cultural discourses, it engages the similarities and differences between these uses not simply to compare or contrast them, but to trace the ways in which race operates between these discourses as a means of comparison and contrast—as difference. In doing so, it looks at race both as a justification for archives (for instance, the reason behind national censuses or eugenic archives) and race as an archival trace—as document of (evidence for) biological or cultural histories.

In challenging the concept of race as an ontological category, “Programmed Visions” places into question the analytical practices whose search for difference is founded on the assumption that such variances pre-exist an observer’s

attempts at cataloguing them, rather than being specified initially through intersecting discourses that are crystallised variously within scientific research, expressed throughout culture, and structured into technology. The challenging form and diverse contents of Chun's archive offer no single depiction of how these discourses sustain particular conceptions of race, as both a phenomena in itself and as a tool of classification, but demand instead for the reader to formulate her own conclusions in the real time of practice—a perquisite that does, however, indicate the resistances exhibited by “Programmed Visions” against a vision of the archive as embodying, and giving justification for, absolute structures of thought, which can suggest all too readily their transcendent reality.

The second most significant consequence of the logistical challenges involved in navigating “Programmed Visions” is that it demonstrates the role of nonhuman, material agencies in upholding the categorisations by which humans and observable phenomena are classified more generally. That is, the disruptive capacities brought to the reading encounter by “Programmed Visions” as a technological agent make explicit the way in which material systems give shape to abstract structures of classification. If a pragmatic conception of the archival assembly is one that facilitates reader access to the items contained therein—to become a neutral interface for presenting the objects listed ‘in-themselves’—“Programmed Visions” reveals the constructed nature of this transparency by making its materiality a resistant agent in the developing encounter with the reader.

In Pickering's terms, the evolution of archives, whether expressed through building architectures, preservation facilities, filing systems, or electronic networks, is driven by a dance of agency between the demands of different readers and that which can be enabled through existing technological infrastructures—their mutual resistances and accommodations catalysing the emergence of new archival solutions. This ongoing performance is punctuated by temporary stabilisations of the relations between the material agencies involved, in which the archive functions repeatedly, reliably, and predictably in conjunction with the reader's practical awareness of its key strengths and limitations—a reciprocal performance in which the agential capacities of one are adapted to the requirements of the other. It is within these spaces that the materiality of the archive can be rendered transparent, with the classificatory matrices it supports at a formal level appearing to implicate the ontological stability of the subject at

hand. To deploy Pickering's terminology once more, the tamed agency of the archive is a manifestation of the representational idiom—of a fully controllable, knowable world, whose properties can be abstracted into a series of fundamental forms that transcend the observable phenomena they are considered to represent.

In constructing "Programmed Visions", Chun works to disrupt these apparently seamless entanglements of human and nonhuman agency by making the latter a source of continual resistance within the space of the reading encounter. Faced with unpredictable results whenever she clicks her mouse, and unable to access a clear overview of how the different materials are linked together, the reader can only gain a perspective on her near-arbitrary traversals by examining the 'archive overview & re-navigation' screen. Nevertheless, instead of clarifying the situation, the map provided is covered rapidly in a web of vectors that render it impossible to retrace the trajectory that has delivered the reader to her current location.

By undermining the complicity of the archival structure in suggesting the permanence, stability, and ultimate knowability of the subject domain, these deconstructive manoeuvres undercut the representationalist notion that categories of racial difference are rooted in a consistent and stable reality. Moreover, the very functioning of "Programmed Visions" offers a critique of any neutral depiction of the politics of digital technologies in this regard. As pointed out by Martin Rosenberg and Stuart Moulthrop in the third chapter of this discussion, computing systems do not emerge from or operate within a social, cultural, or political vacuum, and so their operational principals cannot be considered a pure consequence of technoscientific pragmatism. Rosenberg in particular draws attention to how the ontological premise of digital technology—and of the software architecture that is predicated upon it, such as the hyperlink—is of a geometrically abstract universe whose fundamental attributes can be categorised into a series of 'immutable laws that are true for all time and that transcend the events they describe' (278). From this standpoint, the binary foundations of all digital computing logic, 0 and 1, are in part a consequence of longstanding processes of abstraction that attempt to reduce the world to ever more fundamental units of precisely formulated difference. By abstracting observable reality into a series of discrete, differential entities, computer systems are better able to engage the world using the fixed algorithmic structures that

constitute their operational architectures—to delimit the complexities and contingencies they might encounter by making certain assumptions concerning their essential being. Although there are useful benefits to be derived from this process, “Programmed Visions” makes it clear that it cannot be dismissed as being politically neutral. In a window that appears immediately after the reader attempts to exit her opening statement so as to explore the rest of the archive, Chun lays out some of the key parameters of her thesis in this regard:

[The] very notion of an origin relies on race for its definition: it is one’s ancestry; the fact of being born from a particular ancestor or race; parentage, ancestry, extraction, pedigree.” (Race itself can mean ancestry, although its origins are appropriately obscure.) So: race as archive—as a moving, racing, origin. Race as justifying the desire for an origin and an order, a cataloguing and system of ordinances. Race as answering the question: what is an essential rather than an accidental difference.

From Chun’s perspective, race constitutes a principal driver of the desire to discern, define, and affix the essential differences that characterise the observable world, and which facilitates in turn the imposition of order and control onto its contingent behaviours. In this respect, the algorithmic abstractions of digital computing can be depicted as perpetuating an impulse that is entangled with a drive towards the differential othering of myriad phenomena, human beings included. The fact that “Programmed Visions” has been created as a digital artefact can be understood consequently as an attempt at engaging this problematic directly—not to transcend or to overcome it, but to engage it critically through practice. Here, Moulthrop’s own counter to Rosenberg’s argument makes itself apparent once more. In documenting the intersection of human and hypertextual agency in practice, as enacted by students in his class, Moulthrop observed a dynamic of ‘global variability in tension against local coherence’, with the logical structures of digital systems producing unpredictable, disruptive effects when entangled with a world that is itself articulated through such interplays between structure and emergence—between acts of resistance and accommodation in the dance of agency, to use Pickering’s terminology (Moulthrop 308). In the oscillating dialectics of practice, the rigid structures of digital technology are not, despite their underlying principles, straightforwardly

prescriptive in their actions, dictating the operations and outcomes of the processes in which they are engaged, but behave instead as a particular kind of participant in the world's becoming, functioning as a source of resistive agency that is then responded to adaptively and creatively by the agential forces surrounding it, reshaping its own behaviours in turn.

It is in light that the disruptive behaviours of Chun's "Programmed Visions" can be understood. In refusing any ostensible transparency that the smooth running of technical artefacts can impart, this archive represents not simply an attempt at reintroducing the emergent complexity of a world that the representational idiom of digital systems seeks to minimise, but to show how these vectors are equally a part of their functioning in an evolving agential environment. Whilst this gesture of resistance is enabled only through the very abstractions it opposes, this fact stands not as a testament to its inherent futility, but for the need for it to be re-enacted continually. The critical goal of Chun's archive is not to generate finalised answers that will stand true for all time, but to provide an instance of the potential for transforming existing systems of thought along with the material infrastructures through which these are articulated and sustained.

As a form of scholarly criticism that draws on the performative potential of digital systems, "Programmed Visions" bears out an argument for knowledge as being always in the making—as enabled through the entanglement of multiple agencies whose ostensible differences are crystallised as part of the performance, rather than pre-existing it. In testifying as to the agential legitimacy of the nonhuman within human knowledge-making, this performative digital archive represents an effort at developing an alternative mode of approaching, knowing, and communicating the human condition more broadly, in which absolute bodies of knowledge and control give way to processes of change and becoming—and thus, opportunities for new ways of coming to know the relations between human beings and the nonhuman environment of which they are part.

5.4. Performing Digital Criticism

"Narrating Bits" and "Programmed Visions" both represent conspicuous examples of scholarly texts in which the performative capacities of the digital medium are integral to the critical work they convey. In so doing, their deployment

of the digital medium enables these texts to operate as a form of nonmodern theatre, in Pickering's sense of the term: articulating an exploratory mode of engaging both the subject at hand and observable phenomena more generally, with knowledge ceasing to be a standalone body of description, and manifesting instead through the performative entanglement of different human and nonhuman agencies, ensuring its accountability to a world that is articulated through the same means.

This characterisation of knowledge as being specified and upheld through repeated material performances has been the cornerstone of the arguments made throughout this thesis concerning the expressive capacities of digital literary texts, both in terms of the performative encounters these artefacts enable, and the heuristic practices they articulate through this. The case studies undertaken here and throughout the previous chapters demonstrate how this performative vision is expressed not simply in terms of the mechanical operations of these artefacts, but also through their reshaping of the contexts in which their scriptural outputs are perceived and understood—placing them into different sequences, juxtaposing unexpected materials, and reframing them in light of myriad different configurations. No end goals are specified within these matrices of interpretative possibility, only the evaluation and ramification of their potential, but as highlighted by “Narrating Bits” and “Programmed Visions”, this has important consequences for how their critical concerns are presented—making explicit the processes involved in the crystallisation and framing of particular intellectual outlooks against others, and thus expressing their inherent contingency.

It is in light of this summary that these various case studies into the performative, nonmodern attributes of digital literature can be concluded by offering a revised response to the problematic that has shaped this thesis from the very beginning: how digital literature can be framed as a distinct domain of study in its own right. In the opening chapter an overview was presented concerning the highly diverse works listed in both volumes of the *Electronic Literature Collection*. It was noted that whilst the *ELC* benefits from its inclusivity, it presents a significant challenge to any scholar who wishes to establish a set of shared characteristics that can be used to distinguish the genre from other forms of literary writing or digital multimedia—either in terms of its technical and formal attributes or the themes and ideas it engages with. Hayles acknowledges the

tensions at work in developing a singular definition of the genre, in that by designating it 'literature' it is framed by certain expectations formed by over five hundred years of print technology and culture, whereas its predication upon networked and programmable media connects it with 'the powerhouses of contemporary culture, particularly computer games, films, animations, digital arts, graphic design, and electronic visual culture' ("Electronic Literature: What is it?"). Nevertheless, rather than seeing this as a problematic to be tackled through the establishment of ever more elaborate boundaries, Hayles accepts the transitional, polyvalent nature of the genre, describing it as a 'hopeful monster' that tests 'the boundaries of the literary and challenges us to rethink our assumptions of what literature can do and be' ("Electronic Literature: What is it?") As a call for more challenging and creative enquiries into the potential of literature in an era of prolific and continually evolving digital computing and communications infrastructure, Hayles' perspective on digital literature as a catalyst for critical thought, rather than as an absolute frame of reference, represents a useful intervention in the perennial debates surrounding the intersection of science, technology, and art.

It is in a similar vein that this thesis has delineated its own understanding and approach towards the digital literary genre: rejecting any static, singular conception of its potential forms, outputs, and enabling hardware infrastructures, and concentrating instead on evaluating its characteristics as an intersection of diverse technical and cultural processes—identifying and discussing shared trends as these manifest within specific texts. Such trends include the algorithmic operations of digital computing architecture, their generation and deformation of interpretable scriptural forms, and their exploration of the relationship between human and machine in enacting and interpreting these forms. It is in seeking to evaluate how these dynamics operate within the space of particular texts that a performative approach derived from the work of Pickering, and informed by the experiments of McGann, has been developed and deployed over the course of this thesis—reading the functioning of digital computing technologies through the dialectic of resistance and accommodation shaping the encounter between the human reader and the nonhuman digital artefact, considering how these govern the way in which the scriptural outputs of the latter are perceived and evaluated by the former.

In characterising the texts of the *ELC* less in terms of their particular technical, formal, thematic, or semantic configurations, and considering instead the potential ways in which these attributes emerge and evolve in the real time of practice, a performative approach acknowledges and makes explicit the problematic of framing digital literature by concentrating on its very transience, multiplicity, and continual re-emergence into new forms—as a repeated performance that enacts different possibilities of becoming within the technocultural matrix that articulates specific texts at a particular moment in time. Rather than seeking to delimit absolute contrasts between these artefacts and other forms of digital or literary production—with the inherent presumption that these divisions will hold true for all time, even in past instances—a performative approach, with its concomitant stance on the processes of knowledge-making, recognises that generic and conceptual differences are identified and sustained not in the abstract, but through real time engagements with the observable vectors in question, and must therefore be re-enacted as part of the critical performance itself, reconsidered with every new act of reading, rather than treated as an *a priori* constant.

What this means for critical practice is that it is only within the context of specific material performances that it becomes possible to establish the relations and differences between various examples of digital literature and other forms of creative production—whether digital, literary or otherwise. The sum of these performances may indeed be used subsequently to develop a picture of seemingly related phenomena that can be categorised as a genre, but the ability to delimit texts which are as creatively entangled with an evolving matrix of technologies and practices as those examined ensures that such manoeuvres are always transient and subject to revision. It is from this standpoint that a performative approach can be understood as delimiting not the properties of a specific artistic genre, but a series of performances that enact the richness and potential of the world from which they have emerged—to articulate the inherent possibilities for change and becoming within the contemporary milieu. In this regard, the lack of generic coherence regarding what may be known as digital literature, at least as it is represented in the *ELC*, or even *Vectors*, can be viewed not as a problem to be overcome but an opportunity to explore—to perceive such collections as sampling different ways of thinking, acting, and transforming the world in creative and critical practice. It is in this sense that a performative

approach asks the critic to rethink continually her engagements with her particular vectors of study, to be ready always to reframe her understandings, and to consider alternative stances through which to actualise, materially and conceptually, the possibilities for becoming that exist in a material, technological, and cultural environment that is always in a state of immanence, always being performed anew.

6. Opportunities: Future Case Studies

6.1. Looking Ahead

The case studies undertaken by this thesis highlight and explore the key parameters affecting a performative understanding of digital literature—evaluating the structures and agential capacities of digital technology as it enables, configures, and delimits the encounter between the reader and the text. Accordingly, the works cited bear out these parameters in a way that is both striking and instructive. Nevertheless, despite covering aspects that are foundational to the genre, these selections are unable to encompass its full range of potential manifestations. This issue stems not simply from limitations of space, for in the opening chapter it was observed that an extremely diverse array of artefacts and practices have been listed under the generic label of digital literature, whose ostensive boundaries are dependent ultimately on the critical imperatives structuring the investigation at hand. Complicating matters further, it was acknowledged that an ever changing technocultural landscape will render gradually many cited instances of the genre obsolete and inaccessible over time, ensuring that any characterisation of what constitutes digital literature is historically contingent by necessity.

It is in finding a pragmatic response to this diversity and fluidity that this thesis has concentrated on evaluating one of the more prominent, stable, and readily accessible collections of digital literary texts available: the two volumes of the online *Electronic Literature Collection*, supplementing this with work from the journal *Vectors*. The key advantage of using these resources is that they provide a ready-made framework for comparing and assessing the most significant characteristics shared by its constituent texts, and thus, a basis for evaluating the viability of both the genre category in the first instance, and of their status as representative samples. A key disadvantage, however, is that additional volumes of the *ELC*, like that of *Vectors*, are compiled only periodically, and this compromises their ability to account for the latest developments in digital literature as they occur—although this status does not depreciate the value of studying its contents as an indicator of longstanding trends, or as an expression of the contexts in which new developments emerge and are evaluated.

In early 2016, the third volume of the *ELC* will be published online, and so bringing it up to date once more (“Electronic Literature Collection 3”). A member of the editorial staff behind this publication, the literary critic Leonardo Flores, has offered the following insight into its contents in an interview with the Italian electronic literature organisation *Gruppo Giada*:

- There is a marked increase in works being developed for mobile and touchscreen based platforms.
- While works in previous collections used external data sources, big data and other online corpora have become sources for works.
- Social media platforms, such as Twitter, Tumblr, and Facebook, have become important spaces for e-literary exploration, reinvigorating e-lit genres like the bots and generative works.
- We are getting increasing technical and aesthetic sophistication in previous e-lit genres, partly because of technological development in motion capture, virtual reality, video game engines, partly due to maturation of practitioners with the form.
- Online communities are adopting and reinvigorating older e-lit forms with new platforms, as can be seen with the bot and Twine communities.
- E-lit is becoming less meta-textual and more about bigger questions, such as identity and politics.

In order to explore how the performative approach outlined across the previous chapters can tackle these developments as part of future case studies, this final chapter will close the discussion by surveying briefly a number of texts that fall within the trends identified by Flores, charting their key characteristics, and considering the questions they raise for a performative analysis. These readings do not seek to be exhaustive, but to evaluate instead the demands an evolving digital landscape will make upon performative investigations into the future.

6.1.1. Network

As noted in the opening chapter, nearly all the artefacts that can be encompassed under the rubric of digital literature make use of commonplace digital publishing

technologies and infrastructures, primarily web based systems, as opposed to harnessing standalone platforms. The increasing use of the social media platform Twitter as a space for hosting digital literary encounters is indicative of the genre's ability to rework creatively different aspects of modern technoculture, exploring its potentialities through practice, and then inviting the reader to do the same as part of her own engagements.

One of the more prominent forms of digital literary production that can be found on Twitter are the varied and colourful 'bot' accounts, which generate algorithmically a stream of tweeted outputs according to a periodic schedule, devoid of any authorial input once established. There are myriad such accounts available, covering a wide range of idiosyncratic topics and thematic concerns. One example is "poem.exe" (@poem_exe) by Liam Cooke, which is introduced simply as an exercise in 'micropoetry', with a link to another account on the social media platform Tumblr, which hosts an alternative stream of generated poetry. Typical outputs from both include:

night traffic
 against a pink sky in
 darkness lingering

sea swells
 but she got away
 smoke rising

orion's belt
 soon they'll burn
 winter light

On Cooke's personal website, he describes "poem.exe" as assembling 'haiku-like' poems using an 'Oulipo technique based on Raymond Queneau's *A Hundred Thousand Billion Poems*.' ("A micropoetry bot") Another link to the website GitHub reveals the source code that drives the generative operations of this bot, with Cooke outlining how each 'poem is constructed by selecting the first line of a random haiku, the second line of another, and the third line of yet another' ("araile/bots") The source does not reveal the specific haikus from which these

poems are assembled, but indicates that every poem generated through this process is filtered so as to ensure its words are seasonally appropriate according to the schema of Japanese *kigo*.

Cooke is a prolific author of generative Twitter bots that explore numerous whimsical subject areas, ranging from lurid news headlines from the ‘Cyberrepublic of Ireland’ (@CyberPrefixerIE) to an unending list of ‘robot recipes’ (@robotrecipes), whose ingredients, attuned to the machinic palate, are an unobtrusive blend of industrial materials, avant-garde philosophy, and electronic music genres—a typical dish being ‘American-style Platinum: Stir existentialism, polypropylene, and plastic film in a clothes dryer. Serve over liquid packaging board.’

Another notable author of Twitter bots with a strong generative component is Allison Parrish. One such is “Deep Question Bot” (@deepquestionbot), which scours an online, open-source semantic network, “ConceptNet”, in order to generate questions that interrogate the conceptual matrices constituting and entangling the varied phenomena it lists—some examples being:

Why does a meditation have to be a contemplation?

Why does a man have to be a monster?

If a possibility is not endless, is it still a possibility?

Why does a concept have to be an abstraction?

Have you ever considered a nature that is evil instead of good? Or maybe a nature that is virtuous?

Another experiment by Parrish is “The Ephemerides” (@the_ephemerides), which she describes as a meditation on what poetry written by an unmanned spacecraft might resemble. This bot mixes raw imagery of the outer planets taken from the NASA OPUS database with algorithmically selected extracts from two source texts, *Astrology: How to Make and Read your own Horoscope* (1920) by Sepharial, and *The Ocean and its Wonders* (1874) by R. M. Ballantyne. Parrish

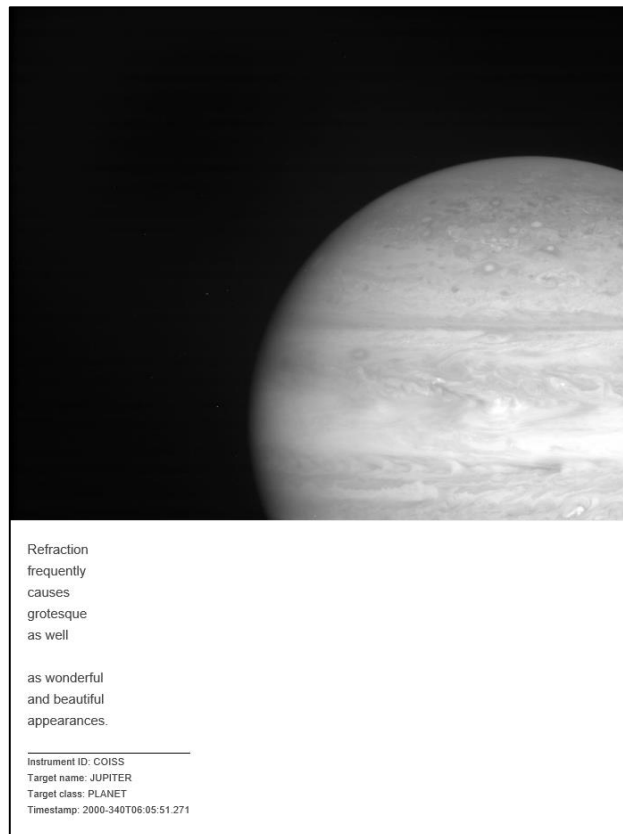


Fig. 28. An excerpt from the Tumblr mirror of the “The Ephemerides”. The main text reads: ‘Refraction / frequently / causes / grotesque / as well / as wonderful / and beautiful / appearances.’ The label below indicates the spacecraft instrument used to capture the image, and its accompanying timestamp.

notes on her personal website that the ‘first text contains references to the planets and their movements, and how those movements can be interpreted; the second text is about the open sea, water, ice and lengthy, often one-way voyages into the unknown. A perfect combination for the language of space probes!’ Having processed these source texts in order to separate them out into their constituent sentences, grouped according to their standalone clauses and grammatical constituents, Parrish’s bot selects and combines different clauses at random so as to produce juxtapositions that are appended to a random image selection from OPUS. The outputs resulting are then posted on Twitter before being mirrored onto a separate Tumblr account—a sample from the latter is shown above in fig. Fig. 28.

In describing the inspiration behind her speculative exercise in nonhuman poetry, as catalysed by locations that are themselves far removed from unaided human perception, Parish, again on her personal website, cites an earlier

observation concerning the relationship between the exploratory functions of robotic spacecraft and autonomous poetry generation:

[B]oth space probes and generative poetry programs venture into realms inhospitable to human survival and send back telemetry telling us what is found there. For space probes, that realm is outer space. For generative poetry programs, that realm is nonsense. Humans generally shrink from nonsense, but a good poetic procedure can demonstrate that nonsense is worth engaging with: there are infinite undiscovered gems of language that lie hidden within nonsense's borders.

Parrish's observation is of value here because it connects neatly with the themes that have shaped much of the discussion thus far concerning a performative understanding of digital literature, touching on the entanglement of human and nonhuman agency in the perception and enactment of possibility in the world—as an instance of nonmodern knowledge-making. Twitter and Tumblr bots such as those developed by Cooke and Parrish can be read in the same light as the generative texts discussed in chapter four, in which the digital algorithm is presented as a source of emergent juxtapositions that provoke insights into the potential afforded by extant structures and processes—directing the adaptive, creative vectors of the reader's interpretative agency as part of her performative entanglement with a nonhuman agent. Both “The Ephemerides” and “Deep Question Bot” in particular thematise the human-algorithmic exchange as part of an open ended exploration of the world's becoming, for in interrogating the capacities of their sources to produce conceptually provocative configurations, these bots enact the move away from the goal oriented, functionalist, and humanistic imperatives of the modern worldview, and towards the catalytic moments of nonsensical behaviour arising from the dance of agency. Here, the vitality of nonhuman agency within human intellectual practice is made apparent, with the experimental realisation of novelty becoming an end in itself, and in crystallising these aspects within the space of the performative encounter with the reader, generative bots can be characterised subsequently as a delimited instance of nonmodern knowledge-making in action—as a tool for imagining another way of exploring and enacting the world.

Moving beyond these immediate resonances with the generative digital texts discussed previously, there are numerous opportunities for further enquiry afforded by the very status of Twitter and Tumblr bots as networked entities. Broadcasting across populous and richly varied social media platforms, the context of reception for their outputs is quite unlike that of the standalone generative artefacts documented in the *ELC*, which operate on the presumption of their being actualised and explored by a single reader within the space of a specific reading encounter. In being posted online, each and every output of these generative bots is recorded and rendered available for as long as the platform in question remains viable. These outputs can then be viewed and engaged by a wider reading public on a daily basis, who may affix 'like' or 'favourite' markers to entries they find interesting, respond with their own commentary, or share them as part of their own outputs across the network as a whole—all of these varied interactions being reflected by the original entry in the form of basic statistical markers, numbers of 'retweets', 'favourites' etc. The material generated is no longer contained within the closed circuit environment of a standalone artefact at a specific moment in time, experienced only by a particular reader, but contributes instead to a globalised exchange of material that engages in topics and themes that encompasses the full spectrum of human knowledge-making.

As a delimited framework for elucidating the knowledge-making relations between human and machine, the performative approach outlined in this thesis cannot prescribe a holistic array of responses to the sprawling totality of this condition, as it affects the interpretative environment in which the outputs of specific bots are evaluated. Nevertheless, in considering this social media context at its very broadest, the imperatives governing a performative standpoint suggest two interlinked perspectives that are of significance to future analyses. Initially, the very operations of generative bots reveal the domain of social media as constituted not simply by human social and cultural relations, but also the nonhuman forces that contextualise and mediate these relations within a digital environment. The overt, autonomous agency of these programs give cause for considering the machinic context in which human interactions are channelled within this domain—both in terms of the interface and output constraints that give different platforms their identifying characteristics, as well as the hidden structures that enable autonomous programs to interface successfully with

systems designed ostensibly for human use. In so doing, these programs emphasise how the exchange of material that is carried through the social media network emanates from both human and nonhuman sources. Bots such as “poem.exe” and “Robot Recipes” show these nonhuman sources to be legitimate contributors to the exchange in their own right, rather than as always merely recycling extant materials—as is the prerogative of myriad bot programs that frequent the landscape of Twitter in particular, gathering and republishing the work of other users and content creators for various ends. In forms such as “Deep Question Bot”, they demonstrate also the capacity to provoke and shape the knowledge-making that takes place as part of this exchange, becoming explicit partners in its creation and communication. In short, the social network is revealed to be an entangled exchange between the human and nonhuman, not just in the material conditions of its functioning, but as part of the visible activity that characterises its culture—a two-pronged challenge to any crude dualism between these domains. This scenario is what Pickering has characterised as the very basis of the nonmodern worldview, ‘in which people and things are not so different after all’, and it is from this standpoint that the operations of generative bots can be understood as articulating a specific political vector, offering within a networked context—and thus, at a scale far larger than themselves—a depiction of another form of knowing, and being, in the world (*The Cybernetic Brain* 18).

6.1.2. Simulation

Another development noted by Flores concerning the future of digital literature is its increasing use of the tools, technologies, and infrastructures developed by the digital gaming industry for simulating navigable virtual environments—providing another mechanism for exploring the intersection between the scriptural forms characterising the traditional literary experience with the audio-visual capacities of digital systems. In the opening chapter, it was observed that this redeployment of computer gaming technology is a recurrent aspect of digital literary production, not just in its harnessing of comparatively recent platforms, as seen in Sandy Baldwin’s *New Word Order: Basra*, but also in its periodic engagement with older forms such as interactive fiction, exemplified by Emily Short’s *Galatea* and Dan Shiovitz’s *Bad Machine*.

One recent instance of this convergence between the technologies and formal conventions of digital games and those of digital literature is *Dear Esther* (2012) by development studio *The Chinese Room*. Although characterised as an experimental game on its official website, having begun life as a modification of the game *Half Life 2* (2004) by Dan Pinchbeck in 2007, *Dear Esther* exhibits nothing of the task oriented environment this label suggests. Instead, it presents the reader with a virtual landscape that she explores freely from a first person perspective—its narrative vectors being carried through her movements, which trigger narrated text outputs at various points (“About”). Described in less abstract terms, *Dear Esther* places the reader in the role of an unnamed man grieving over the loss of his partner in a car accident, walking across a deserted Hebridean island that appears to give him a sense of isolated solace. As the reader travels through its various beaches, coastal paths, and river valleys, she arrives at locations that prompt her character to recall excerpts from the letters he has written, or is in the process of writing, to his deceased partner—the titular Esther. These letters constitute an extended monologue of the man’s thoughts, feelings, and encounters on the island as it prompts memories of past experiences, mediating on themes of loss, trauma, forgiveness, and acceptance. The letters themselves appear on the screen as short captions that are narrated aloud by the character himself (see fig. 29, page 200).

In chapter one it was acknowledged that works such as *Dear Esther* pose a particular challenge to the use of ‘digital literature’ as means of referral. Although it is reliant inherently on digital technologies, a question arises as to whether ‘literature’ is a suitable framing paradigm for encompassing the aesthetic effects generated, given how it risks obscuring their origins and contexts within the technologies and practices of digital gaming. As with the other works discussed throughout the previous chapters, this thesis has derived its critical stance concerning the extent and limits of digital literature as a genre category from the work of Hayles, who contends that to read the literary in the context of the digital serves as a means of rethinking the ways in which the former is received and understood in a changing technocultural landscape, rather than a crude act of critical imposition. Digital literature thus exists as an always provisional construction: a specific critical framing designed to generate alternative perspectives and insights, rather than an attempt at imposing a singular



Fig. 29. Screenshot of *Dear Esther*. Note the caption at the bottom, which is narrated aloud for readers with audio speakers.

interpretation of the phenomena in question—indeed, the goal is to consider its transformative impact. Therefore, to examine *Dear Esther* and other such works as a form of digital literature is to explore how those aspects which resonate with literary expression are affected by their articulation through the capacities of the digital medium, accepting that these readings are neither seeking nor claiming to be exhaustive.

The performative critical framework developed throughout this thesis has sought to provide one such model of the relationship between these expressive outputs and the digital systems through which they emerge, before delineating how this relationship, as it is crystallised within the entanglement of human and machine, opens up a broader array of intellectual and political questions regarding the processes of knowledge-making in the world. The task of exploring the efficacy of this standpoint has been assisted through the reading of texts whose expressive concerns have pivoted around their very status as creative redeployments of extant digital technologies. Nonetheless, as Flores' brief survey points out, now that the intersection of the digital and the literary is no longer novel in itself, this self-reflexivity is giving way to a broader array of narrative, thematic, and semantic concerns. Although a performative approach is able to describe how the reader's negotiation with the medium shapes the text's unfolding, and to suggest a politics arising from this, the increasing engagement

of digital literature with themes beyond the structures, functioning, and operative assumptions behind computing technology raises the question of how a critical vocabulary derived from interrogating scientific and engineering practices can frame the ostensibly broader concerns of works such as *Dear Esther*.

One way of considering this issue is to accept that although a performative approach cannot offer a direct response to myriad, highly complex thematic vectors, it can be understood as an opportunity to reconsider them in light of various issues raised by the medium itself. That is, to extend the reading of these works by placing their thematic explorations into dialogue with the systems through which they are accessed, considering bigger questions that may not form an explicit component of the former, but which are part nonetheless of the context in which the work as a whole operates. The point is not to reduce the work back to a self-reflexive exploration of its own medial capacities, but to offer another perspective on how the medium extends these expressive concerns into other territories. The scholarly digital texts discussed in chapter five provide a model of this understanding in action, using the medium to articulate not only their arguments in ways that align with their conceptual structures, but to consider how they are affected by the digital environment in which they are expressed, and how they might seek to rework it in turn.

Reading the performative entangling of medium, form, and content within *Dear Esther*, a particular dynamic stands out concerning the limits of representation, of the significance of moving through a simulated landscape, and of the digital context in which both are considered. Although the story is conveyed chiefly through disparate letter fragments, these are tied inextricably to the virtual locations the reader uncovers as part of her wanderings across the island. Many of these letters refer explicitly to their surroundings, but as the reader journeys ahead, their underlying subject matter is reflected increasingly in the changing landscape, evoking the car accident that is mentioned only obliquely, e.g. scattered wreckage in unlikely locations, lit funereal candles littering the beaches. The simulacrum of a Hebridean island begins thus to unravel, exhibiting progressively imaginative features, and this suggests not only that it is enacted partly through the central character's imagination, but it highlights subsequently its status as a carefully turned performance from the reader's standpoint—as a machinic agency that is responding to her actions, rather than a transparent window into another domain.

This collapse of the boundaries delineating the imagined and the actual within the story world, which highlight nonetheless its articulation within a constructed digital artefact, is suggestive of the limits of representation to encapsulate the extremes of human thought and emotion. As the initial failure of written language to encompass the key events motivating the story, the fatal car crash, unfolds into a more generalised failure of the narrated and simulated environments to reproduce the signifiers of an objectively verifiable domain, any assumption on the reader's part concerning the stability and efficacy of representation as a means of knowing the world is placed into question. Here, the contemporary usage of digital technologies for simulating observable phenomena with supposedly great fidelity, particularly in the context of games employing the same virtual graphics engines, stands in contrast with the increasingly contingent landscapes presented to the reader, and so further unsettling the conventions of representational knowability.

The cumulative effect of this scenario is that a performative engagement with the landscape becomes the preeminent mode of expression within *Dear Esther*, with both the reader and the central character's wanderings acting as the principle vector through which its expressive potential is animated. For the central character, the landscape functions as a nonhuman partner in his attempts at enacting that which he is unable to capture within his letters, manoeuvring through this milieu and encountering highly varied spaces that provide new frameworks for structuring his thoughts and feelings. The character's journey thus constitutes an extended engagement with the shape and structure of his surroundings as they intersect with his interpretative agency, an interplay whose potential for signification is crystallised at various points through the appearance of novel imaginative forms. This is a dance of agency that is resonant with Pickering's own application of the concept to artistic practice, which he casts as an experimental engagement with the expressive capacities of different materials.

The investigatory process enacted within the story world is entangled inextricably with the actions of the reader, who is developing similarly her understanding of the significance of the virtual landscape as part of her encounter with the work, both in terms of its role within the story world, and in mapping the changes it exhibits as a simulated environment. In the latter case, the way *Dear Esther* harnesses the technologies and graphical conventions of 3D first person

gaming to present an experience that, conversely, is devoid entirely of any specific tasks and puzzles, gives cause for evaluating the potential of digitally enacted spaces to facilitate experiences other than those associated with ludic or simulative activity. *Dear Esther* offers one such model of this potential in action, and reading it as instance of digital literary expression reveals it to be continuing the genre's experimental redeployment of digital technology to explore, enact, and shed light onto its capacities for other modes of expressive behaviour. Although this nonmodern heuristic is only an implicit component of the experience of actualising and understanding *Dear Esther*, it provides an evaluative context for suggesting the greater critical import of its efforts in unlocking alternative ways of enacting and understanding the contemporary digital experience, signifying how it might unfold in future.

6.1.3. Locative

Increasing engagement with the technologies, conventions, and contexts of simulated virtual environments is not the only development affecting the shape, structure, and interpretative background of digital literature. The contemporary proliferation of mobile computing systems, devices, and interface paradigms is also having an impact on the types of work being produced. One notable manifestation of this influence is in the form of texts that either accompany the reader as they journey through different locations, or are designed to respond to particular cues once these are reached, supplying or generating outputs that interpret the particularities of these locations in different ways.

One example of this can be found in the work of writer and artist Matt Blackwood, who has produced a number of works based on Quick Response (QR) matrix codes being planted at various sites across the city of Melbourne, Aus.—cafes, art studios, public squares—which can be scanned using a smartphone or tablet computer to bring up a narrated story set within these surroundings. Example works include *1Story* (2013), *StripLit* (2013), and *6Stories* (2012), which offer narratives concerning the everyday work routine, a conversation at a café, and exchanges at a fictional speed dating event, respectively (see fig. 30, page 204).

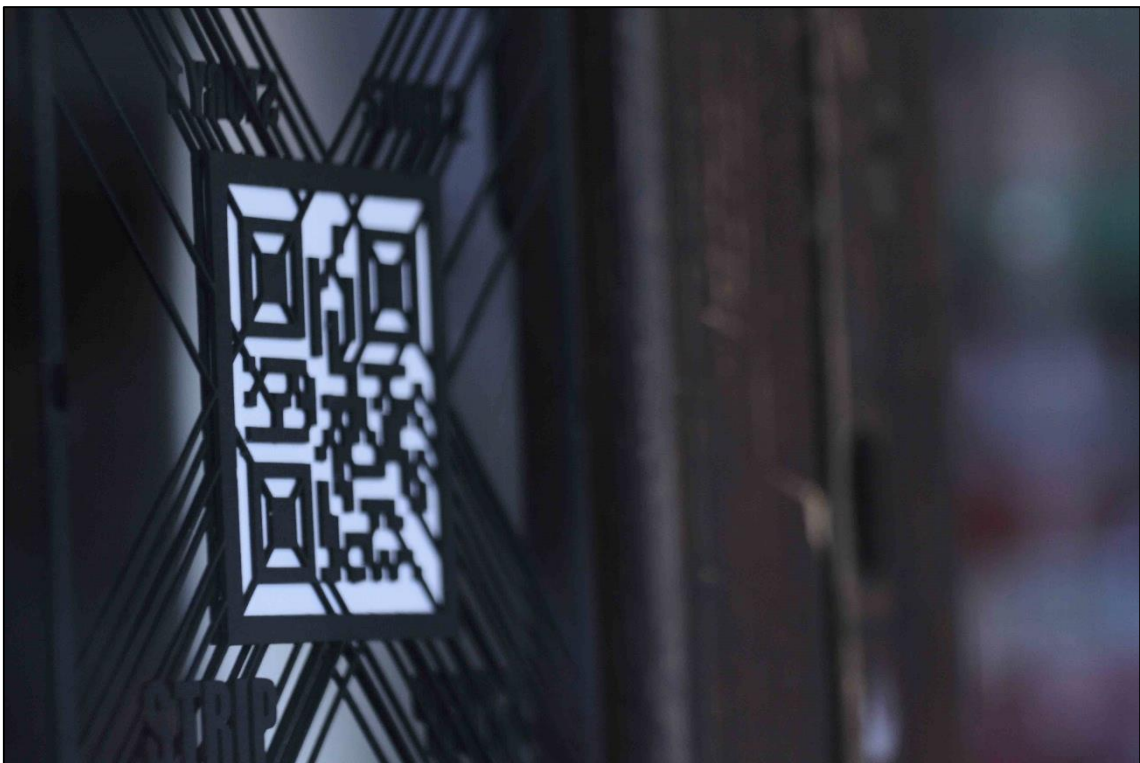


Fig. 30. Photographs of *1Story* (top) and *Striplit*. Source: Blackwood, Matt. "Portfolio." *Matt Blackwood*. n.p. n.d. Web. 10 Dec. 2015.

A more technically sophisticated instance of a work that draws from its immediate surroundings is *AndOrDada* (2012) by Beat Suter and René Bauer. This takes the form of a smartphone application (Android OS) that collects data on local WiFi emissions and uses these to generate abstract poetic phrases in real time, these being narrated aloud by the smartphone's text-to-speech synthesiser. In its listing within the online *Anthology of European Electronic Literature*, run by the organisation *Electronic Literature as a Model of Creativity and Innovation in Practice* (ELMCIP), the authors describe the concept behind *AndOrDada* as that of a 'road poem':

The reader strolls through town and her immediate area generates a poem. She walks further through town or rides a bus and the poem changes according to her location in town. *AndOrDada* is an endless poem; *AndOrDada* is adaptive locative Dada. It reads, writes out and interprets the subconscious social structure of a town. The *AndOrDada* software works as an adaptive poetry-tool with locative levels. It generates new scenes and environments in the tradition of the situationists.

Despite the apparent focus on a town environment, *AndOrDada* works effectively wherever WiFi emissions can be detected, although the multiplicity of hotspots to be found across the contemporary urban landscape ensures a richer and more dynamic range of outputs than can be achieved when travelling elsewhere (see fig. 31, page 206).

Similar to the generative Twitter bots discussed previously, these locative works are notable for how they articulate the networked character of the digital environment in which they are embedded. All digital literary texts are predicated on a matrix of standardised hardware and software components that operate at scales far above and below the particular sequences of code assembled by their authors—from the embedded microcode governing the digital devices on which they are accessed, to the energy infrastructures and socioeconomic exchanges that enable and sustain all digital activities, objects, and environments. Blackwood's stories and *AndOrDada* incorporate these networks as an explicit component of their technical and expressive functioning, being incomplete and inoperative until they are brought within a certain threshold of proximity to

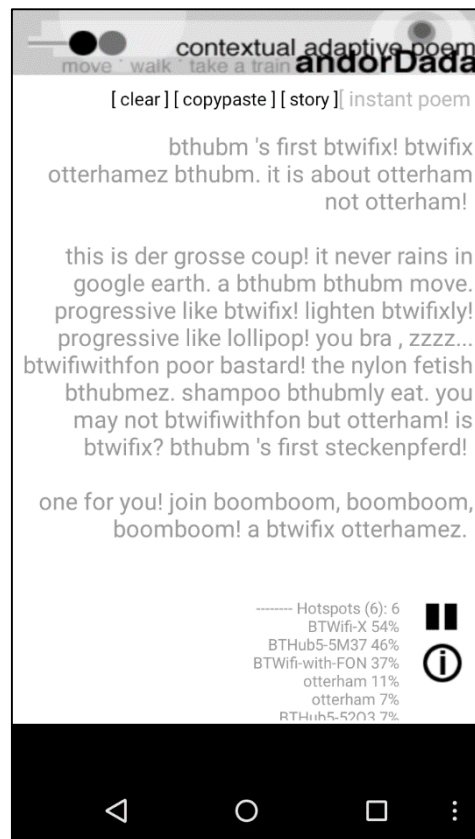


Fig. 31. Screenshot of *AndOrDada* as it appears on a smartphone. Note the names of the WiFi hotspot emitters listed at the bottom, sorted according to signal strength, which is indicated as a percentage. The stronger the signal, the more likely the names associated will appear within the main body of the work's output.

specified points of access—QR code codes and WiFi emitters. Consequently, these texts manifest only once particular spatiotemporal parameters are fulfilled by the reader, but it is these which, conversely, become a vital source of variation in the encounter that emerges subsequently. In the case of Blackwood's writings, the reader can access the narrated text only when she is standing in the immediate vicinity of its various site installations, and the shifting patterns of activity taking place within these surroundings, both human and environmental, affect significantly the context in which the encounter as a whole is perceived and interpreted. Although the reader can access recordings of Blackwood's narration online, this elision of the locative factors that are integral to the context of his writing yields a very different and significantly diminished experience. By contrast, *AndOrDada* frees the reader from having to remain within a particular location, but in order to produce a varied stream of outputs she is required nonetheless to

be on the move, negotiating the contours of not only a dynamic built environment but an ever shifting electromagnetic landscape.

The transience, specificity, and agential contingency of these locative literary encounters constitutes a fundamental aspect of their expressive potential. Whilst these characteristics form part of the dynamic exhibited across all works of digital literature, locative texts make these significantly more apparent than in standalone instances that can be actualised without the reader having to account for her immediate surroundings. A performative critical framework is thus well suited for describing the functioning and status of these texts as a network of intersecting agencies—as a temporary crystallisation of myriad structures and processes that stretch far beyond the immediate bounds of what might be described as the ‘text’ and into the greater material environments in which it is enacted. That is, the very operations of locative digital texts highlight their status as one of innumerable agential performances enacting the observable world, and although this may not constitute an explicit component of their stated thematic concerns, it forms nonetheless a critical background that a performative framework can elucidate as part of an extended reading of their expressive capacities.

It is from this standpoint that locative texts, in revealing the matrices of agency that enable, constrain, and constitute the digital literary encounter, offer the beginnings of another manifestation of a nonmodern approach to knowing, depicting, and reconfiguring the world. Initially, unlike the majority of works found in archives such as the *Electronic Literature Collection*, they reject the interface structures associated with desktop computing—a static framework of keyboard, cursor, and screen—in favour of the more flexible architectures afforded by mobile devices. Like the installation works examined in chapter one, such as *Screen* and *Still Standing*, locative texts highlight the particular restrictions implicit in the design of desktop computing and suggest alternative paths for enabling and understanding the intersection of human and digital computing agency—one that makes a preliminary attempt at harnessing paths of action and expression that are elided expressly by the latter, acknowledging the far larger range of contexts in which knowledge-making and adaptive behaviours manifest. Admittedly, these texts are far from unique in this regard, given the proliferation of mobile digital devices to the point of near ubiquity in many developed environments, and which are all engaged collectively in facilitating new ways of

accessing and deploying the particular agency of digital computing for innovative ends. Nevertheless, these locative works do represent a significant space in which the transformation of literary expression within an increasingly mobile digital landscape is enacted and assessed—a space in which literature responds to the new modes of transmission and expression afforded by evolving digital infrastructure. Working, as Hayles has pointed out, in the context of over five hundred of years of print culture, and the expectations concerning literary form that have been established and sustained by this, the experimental activities of locative texts are all the more striking, particularly in cases such as *AndOrDada* which respond adaptively to some of the most fluid aspects of their surroundings (“Electronic Literature: What is it?”) The specifically nonmodern aspect of these works comes out of this twofold reconfiguration of both their own contents and that of the computing systems in which they are embedded, presenting outputs whose open ended becoming—whether in terms of their varying configurations or the contexts in which they are received and interpreted—is dependent on an experimental redeployment of existing technologies for ends very different from that which they were developed originally—QR codes for storytelling, or, more radically, the use of roaming WiFi reception to give shape to a poem. Although texts such as *1Story* or *AndOrDada* represent only preliminary instances of this type of engagement, they are suggestive nonetheless of the future potential of digital literature to engage, reform, and present new avenues for knowing and articulating the agential entanglements, both human and nonhuman, giving shape to an emergent world.

6.2. Epilogue

This brief survey of some of the key developments in contemporary digital literary production is indicative of how the genre is evolving rapidly in line with that of the greater digital environment from which it emerges. One of the main problematics driving this thesis has been to develop a critical framework that can account not only for the dynamism and diversity exhibited across myriad individual texts, but to articulate holistically a mode of literary expression that exists in a state of continuous change and transformation.

A performative approach, derived from critical accounts of scientific and engineering endeavour, provides one path through which these emergent

characteristics can be described, discussed, and their creative, critical, and political significance accounted for. As digital literature becomes entangled within new configurations of technology and culture, and precipitates the basis for new entanglements in future, a performative reading is revealing of how creative and critical knowledge-making, as practiced by artists and scholars, converges within the space of these texts to not simply identify but to enact new vectors in the world's becoming. Digital literature thus represents an open ended exploration of these different potentials as they emerge and evolve through practice, presenting fresh opportunities for engaging, accounting, and configuring the intersection of human and nonhuman agencies for progressive ends.

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