HYPERTEXT IN THE LAST DAYS OF THE BOOK

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How will literature survive the development of other media of communication? Already we no longer believe, as it was believed from Aristotle to La Harpe, that art is an imitation of nature, and where the classics sought above all a fine resemblance, we seek on the contrary a radical originality and an absolute creation. The day when the Book ceases to be the principal vehicle of knowledge, will not literature have changed its meaning once again? Perhaps we are quite simply living through the last days of the book. (Gérard Genette)¹

... plan to throw one away; you will anyhow. (Frederick P. Brooks, Jr)²

PREHISTORY

Is it possible that books are the preliminary, now inadequate design for organizing, containing and presenting our textuality, and that the new, improved design, superior to the old membrane or paper book, is the phenomenon we call ‘hypertext’?³ In fact, hypertext is not new.⁴ Studies in orality tell us that human language, in as primitive a form as we are justified in imagining it, was much less linear than literacy has forced the written language to become. This lack of a consistent linearity is the result of a rhetorical complexity in which blocks of discourse are linked to other blocks, and these to others, just as the automated teller machines at our banks offer us several operations to

² F.P. Brooks, The mythical man-month: essays on software engineering (Reading, Mass.: Addison-Wesley, 1975; rpt. with corr., 1982), 116. Brooks’s delightfully written essays should be read by anyone contemplating the development of computer projects, such as electronic editions, pedagogical software or humanistic databases. He discusses the social, intellectual and managerial environments in which such projects are realized, and he recommends sensible, efficient ways of anticipating and confronting the problems which inevitably arise.
³ The concept of ‘hypertext’ was articulated by V. Bush, ‘As we may think’, The Atlantic, 176 (July 1945), 101-8 (reprinted in S. Lambert and S. Ropiequet (eds.), CD-ROM: the new papyrus (Redmond, Wash.: Microsoft Press, 1986), 3-20). ‘It affords an immediate step, however, to associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another. This is the essential feature of the memex [Bush’s name for a hypertext production machine]. The process of tying two items together is the important thing’
choose, each of which leads to a new interrogation with other operations to choose from, until – having moved deeper and deeper into the machine’s confidence (and the machine, perhaps, into ours) – we complete the transaction we initiated.

Like such bank machines, the narratives produced by oral cultures constantly branch out, and – also like the machines – the branch to be followed is a matter of choosing among those offered. Oral texts are replete with descriptions and invocations of events and heroes which lead one back to other events and heroes, and those to others. The result of such linking is a resemblance (but only a resemblance, of course) to Nature and the fullness thereof. Its cause is the fact that the oral text is always drawn from a stock of related texts or ‘intertext’. The whole purpose of Nestor’s garrulous memories in the *Iliad*, for example, can be seen as the necessity to link his tale of Troy to every individual whom Homer could not otherwise manage to bring into the story directly. The intertextual connections of the war with the judgement of Paris, a consequence of the wedding feast held for Peleus and Thetis, itself a consequence of Prometheus’s plea bargaining with Zeus, which was a result of the Titan’s acculturation of humanity, is a neat demonstration of a hypermyth which could ultimately embrace all of the narrative material ancient Greek culture produced. Research of the last three-quarters of a century suggests that such texts were developed orally and maintained in an oral culture.5

The essence of a collective human textuality is – and has always been – its potential to be a hypertext. That ‘works are created by works, texts are created by texts, all together they speak to each other independently of the intention of their authors’ is a commonplace in literary and cultural studies today.6 The means by which these textual conversations, as it were, take place are directly analogous to what the namers and devisers of hypertext have called ‘links’ and ‘nodes’. Links are connections among texts, but they are more, too. They are discourse within a discourse charged with the extra function of providing an intellectual bridge from one text to another. More accurately, links, in fact, provide bridges from one part of a text to another part of a text, and while it may seem to us as if we have moved

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to an entirely new thing, the link itself guarantees a single continuity, a single text. Nodes are these domains of discourse which links link. 7

One has to be quite in league with the assumptions of literate, hard-copy texts to believe, for example, that primary epics produced by oral cultures, such as the Iliad, the Odyssey or even Gilgamesh begin in medias res simply because it is conventional to begin at 'a critical point in the action', 8 although the use of such openings in literate imitations of primary epic, such as the Aeneid and Paradise lost, function as conventions (and as links back to primary epic, perhaps). Primary epics open in medias res because they are chunks of an oral culture's intertext. While they may construct a narrative which satisfies us as containing a whole and resolved action (especially after they pass through the hands of a literate reductor-editor), their beginnings (and their endings, as well) may be residual evidence of their having been snatched from a larger textual tradition. The digressions within them are potential links to other nodes which poets or their auditors may choose to recite or have recited immediately, thus springing out of the first tale, into another one.

Even if the medieval period had not been a time of great political, religious and cultural change, but could only lay claim to being the period during which the West moved from oral textuality to literate textuality (although it is impossible to imagine such a shift in textuality which neither resulted in, nor was caused by, other cultural changes), then the medieval period would still be the period during which the developing technology of the book effectively marginalized the sort of hypertextual access to the intertext which more purely oral cultures took for granted. During the medieval period, intellectuals negotiated between two approaches to texts, similar to what Hayden White describes as 'a linguistic theory of the text and . . . a specifically semiological conception of it'. 9

By a linguistic theory of texts I mean one that takes specifically lexical and grammatical categories as elements in its analytical model and, on the basis of this model, seeks to establish rules for identifying a 'proper,' as against an 'improper,'

7 But see G. Landow, Hypertext, 52-3; in lieu of 'nodes', Landow borrows Roland Barthes's term, 'lexia' (R. Barthes, S/Z, trans. R. Miller (New York: Hill and Wang, 1974), 13). The term is awkward, not only because it seems morphemically irregular for speakers of English (in spite of the fact that we are told that the plural is indeed 'lexias'), but because the origin of the term associates it with a critical methodology whose assumptions with regard to hypertext cannot yet be precisely stated. While 'node' has its own associations in networking theory, it does not imply that a sequential text has been deconstructed, whereas a lexia is one of the several slivers of a sequential text which Barthes would cut up to examine the illusory nature of its 'smooth surface'. Certainly, a hypertextual reading interrupts such a rhetorical surface, but it does not necessarily deconstruct it; I rather think that hypertextual readings are to be regarded as constructs which may or may not choose to exploit one or more strategies for giving the text some sequential properties.


instance of language use after the manner of Russell, Wittgenstein, Austin, or Chomsky. By a semiological conception of texts I mean the tradition of cultural analysis that builds upon the theory of language as a sign (rather than a word) system, after the manner of Saussure, Jakobson, and Benveniste, and distinguishes between those sign systems that are extrareferential and those that have as their referents some other sign system. This provides the basis for a methodologically significant distinction between a linguistic inquiry and a specifically semiological one that has important implications for the way we might conceptualize the problem of characterizing the ideological aspects of a given text, discourse, or artefact.

A linguistic conception of the text minimalizes the extra-referential possibilities which characterize the semiotic conception of the text, and concomitantly reduces the text’s potential to be linked, as hypertexts are, to an array of nodes. Literate culture typically champions a linguistic conception of the text, while oral culture tends towards a semiological conception; whereas a semiological view of texts is relatively common in the early medieval period, presumably under the influence of an aristocratic oral tradition, by the fourteenth century, textual attitudes have become predominantly linguistic, just as the centres of power in the culture have become predominantly literate. Indeed, one example of this is the difference between Augustine’s and Thomas Aquinas’s conceptions of the relationship between the literal and allegorical interpretations of scripture. To Augustine, the persons and events of the Old Testament were to be regarded as signs in a semiological sense referring to the persons and events of the New Testament. Each incident in the Old Testament might be seen as a node linked to another incident or node in the New Testament; scripture existed as a hypertext, and could only be understood thus. If one could not follow the path either from the Old to the New Testament or from the New to the Old, then one frequently could not make sense of the text; certainly, the functioning centre of scripture was in the linking of the two testaments, not the textual privileging of the New Testament over the Old Testament. However, by the thirteenth century, a Thomistic approach to scripture had undermined the reciprocity between the two testaments which is basic to supporting a hypertextual impulse. The two parts of scripture,

10 For an extensive study of the ways in which the oral elements of Old English poetry were encoded into the manuscript traditions of Old English texts, see K. O’B. O’Keeffe, Visible song: transitional literacy in Old English verse (Cambridge: C.U.P., 1990).
13 This is not to say that the Gospels were not considered the theological centre of scripture, but I wish to suggest that the act of reading scripture in the early Middle Ages centred on the links between the two textual domains, which eventually coalesced into the canons of the Old and New Testaments. The Cyprian feasts are excellent demonstrations of this kind of dialogic hypertext, for which see F. J. E. Raby, A history of secular Latin poetry in the Middle Ages, 2 vols (Oxford: Clarendon Press, 1934), i, 220.
now received according to Jerome's text (Augustine preferred the Septuagint over the Vulgate, but by the end of the Middle Ages the possibility of coexisting texts of the scripture could not have been countenanced either – a further testament to the rejection of the hypertextual impulse), formed a linear relationship, the Old Law having become 'an entrance and anteroom to the New'. By the very nature of its networking of tropes, allegorically related texts and allegorical exposition might have provided an excellent foundation for the technical development of a means for presenting hypertexts. I should speculate, however, that the development of allegorical theory as a form of literate exposition, as evidenced here by Aquinas's position on the subject (which I have oversimplified for the purpose of introducing a concept) and Dante's vulgarization of it, would suggest that a rhetoric of linearity, as opposed to a rhetoric of association, was seen as an important contribution to Western discourse. This rhetoric of linearity, similar in impetus to White's 'linguistic theory of text', simply became the dominant rhetoric as literate discourse became the privileged mode of textuality.

Even so promising a technology for the representation of early hypertexts as we find in the great Bible codices and in the Glossa ordinaria which provided extensive commentary in complex ruled margins linked to scripture in the middle of the page – a form of presentation common throughout the Middle Ages – seems to have exerted little influence on the development of modern page layouts and book design, not because the practice could not be imitated in the print shop (it could and it was), but because the mode of textuality it represented – that is, incipient hypertext – was associated with an outmoded past which did not realize the strength of the printed word. I shall return to this concept later in this article (p. 21).

These are, of course, but fragments I have shored against my thesis, and the prehistory of the hypertext awaits a careful, dedicated chronicler. Nevertheless, we have – as readers – all come to the point where we want to interact with texts on our own terms, not on the terms of the text's originators (whether oral or literate). That desire, which might be called 'post-classical' (or even Neo-romantic), has grounded numerous schools of critical theory in the last half century, from the New Criticism of the 1940s and 1950s, through structuralism in the 1960s, deconstruction in the 1970s and early 1980s, to the various approaches now to what is loosely called cultural materialism.

14 Eco, *The aesthetics of Thomas Aquinas*, 157–8
15 The taxonomy of links S. J. DeRose offers in 'Biblical studies and hypertext', in *Hypermedia and literary studies*, ed. P. Delany and G. P. Landow (Cambridge, Mass.: M.I.T Press, 1991), 192-201, can all be managed in a non-computing environment, although 'associative links', the most common form of linking arbitrary, discrete nodes to one another, are difficult to navigate in a codex or printed book beyond one level of linking.
16 But see Bolter, *Writing space*, 199–206, who anticipates some of this argument, and provides an excellent overview of the developmental possibilities of the hypertextual phenomenon.
often uniting textual theory with anthropology and psychology. Except for the New Criticism, which would reject the idea out of hand, all of these approaches deal implicitly or explicitly with the notion of an intertext, a concept in which all texts are part of a single macro-text, and each is related to one another by means of its participation in the intertext. Indeed, the intertext is concomitant with the notion of the unbounded text. Just as it provides the reader with a method for reading a text non-sequentially as one means of reducing the writer's control over the reader, hypertext also provides a means of charting parts of the intertext so that it may be navigated — that is, so that the reader may begin to have some control over it. It may be that, in oral cultures, the intertext is the well-spring of myth which structural anthropologists such as Lévi-Strauss sought to rationalize and define. If so, we can understand why a semiological notion of texts appears generally to attend oral culture. Oral cultures tend to refine myths into coherent networks, like the complex of tales which are a part of the Iliad's immediate intertext. Every text must possess a dimension of extra-referentiality to participate in the network. Thus, every text is an incipient hypertext in an oral culture. Literate cultures, having operated in terms of a linguistic conception of texts, force an aggregate of texts to grow in a sort of linear, historically deterministic fashion. They do not constantly and repeatedly refer to a single collection of concepts — a central myth — but, instead, they continuously augment the content of the intertext. They are, in other words, additive, not reflexive. Consequently, from the end of the Middle Ages until the advent of modernism at the beginning of this century, the conception we had of our textuality provided us with no means to negotiate the intertext. It was simply too large. Only with the advent of computers and extensive electronic networks have we come to realize that we may devise an economical means of access once again to the intertext.

17 See T.E. Morgan, 'Is there an intertext in this text? Literary and interdisciplinary approaches to intertextuality', *American Journal of Semiotics*, 3 (1985), 1-2, cited by G.P. Landow and P. Delany, 'Hypertext, hypermedia and literary studies: the state of the art', in *Hypermedia and literary studies*, 17-18. Landow and Delany (18) unfortunately allow the inference that a text like James Joyce's *Ulysses*, which 'alludes' or 'refers' (the terms we usually employ) to many other texts or phenomena that one can treat as texts, constitutes a hypertext. In point of fact, an allusion represents only one kind of linking, and hypertexts can exist among texts quite free of allusion to one another, as DeRose's anatomy of links in the same collection (192-201) suggests.

18 This is a major aspect of hypertextual alterity, a fascinating introduction to which is Terence Harpold, 'Threnody: psychoanalytic digressions on the subject of hypertexts', in *Hypermedia and literary studies* (see n.15), 171-81.

19 C. Lévi-Strauss, *The savage mind* (Chicago, Ill.: Univ. Press, 1966), 22: 'Mythical thought for its part is imprisoned in the events and experiences which it never tires of ordering and re-ordering in its search to find them a meaning'

20 Classical Greek culture was an oral culture, the presence of writing and written texts notwithstanding. Even the latest of the dramatists, Euripides and Aristophanes, continued to depend upon the same intertext as Homer, Hesiod and Pindar. The content may function in different ways in the late Athenian period, but it is drawn from the same source as the Homeric material.
The physical shape of the book has remained essentially unchanged for nearly two millennia. The Roman epigrammatist, Martial, who flourished A.D. 64–104, is the first writer to mention a codex made of parchment for presenting literary works (as opposed to archival records).²¹ Throughout the period of late antiquity and the early Middle Ages, the possibilities of presenting hypertext, as it was found in the literatures of essentially oral cultures, were constrained by the physical evolution of the codex, the forerunner of 'the book'. Quires of folded membrane were stacked on top of one another and sewn to a common cord to create as large a foundation for the planned text as was necessary. The modern book, with its gatherings glued into a case binding, offers no more varied possibilities for presenting a hypertext than did the original codex. In fact, as the study of manuscript 'booklets' shows us, it is possible that not all medieval codices were necessarily conceived as a single, linear sequence, for many books consisted originally of gatherings or units of gatherings which were loosely associated in parchment wrappers. This would have allowed a certain amount of reordering of the collected texts, and would have thus supported hypertextual readings in limited ways.

As the book evolved, so did an apparatus to support what were, in effect, hypertextual functions, although these were never perceived as adjuncts to presenting a hypertext, since – as has been explained – the linguistic concept of the text which developed concurrently with the book made such a perception unlikely if not impossible. Steven J. DeRose has created a taxonomy of the links which the corpus of biblical studies requires. He describes these links as 'associative', 'structure-representing', 'isomorphic', 'annotation', 'implicit', and 'retrieval'.²² DeRose's taxonomy is designed to refine the notion that hypertext is merely a matter of associative linking, that is linking one part of a text to another. He quite correctly shows that there are many ways in which any part of the text may be accessed from any other part, and it is this ability – whether strictly associative or something else – which creates a hypertext. In point of fact, every one of these types of linking can be demonstrated as having been developed during the evolution of the book.

Associative links 'attach arbitrary pieces of documents to each other, like strings tied from one place to another. In general, they can represent any concept their creator desires. Because of this, they cannot be replaced by retrieval algorithms, or even by unilateral creation on the part of a system "author"'.²³ The restraint that these

²² DeRose, 'Biblical studies and hypertext', 198–201.
²³ Ibid., 191.
links cannot be addressed by retrieval algorithms is a powerful indication of their basic nature: they are essentially defined by the nodes they connect. The convention which accomplishes the same feat in printed books is the 'see below (or above or in note, etc.), p. 000' note which is embedded in the text, either in the main text or in a footnote. It serves the same purpose as the associative link, and its relative lack of density in conventional books in contrast to cybernetic hypertext is an important measure of the difference between the printed and electronic hypertexts.

Structure-representing links 'form the basis for linearizing the text, i.e. for presenting it as a sequence of elements'. These elements may be determined from thematic, linguistic or other structural hierarchies perceived in the text. Page layout and book design have long determined these kinds of link. When a reader picks up a book, one of the first things he or she does is to figure out exactly how chapters, stories, poems, etc. are marked, so that moving from story to story, chapter to chapter, etc. is simple. Some printed documents, particularly legal ones, count every subsection and paragraph with decimal numerals and sigla such as '§' or '¶'. Some even include line numbers. These devices are all designed to help the reader navigate from any known point in the text's structure to any similar structural point, simply by setting up an elementary system of headlines and/or outline tags which preserve a reference to its linear form.

Isomorphic links 'represent the correspondences between structural elements in separate documents'. Certainly, we should expect that cybernetic hypertext will provide us with the ability to move among similar structures of the components of the intertext just as easily as we move among them in the individual text or — to use the term computer scientists prefer — the document. Isomorphic links are also built into printed texts, but the means of using them is not as obvious as other forms of linking parts of the text which have been named here. One of the skills which literate cultures demand is a familiarity with the technology required to avail oneself of the literate text. For most people, negotiating one text at a time and following associative links when necessary to other texts provides a sufficient mastery of the requisite skill. Other people become scholars, librarians and lawyers, and they have to master the technology of accessing the written text to a greater degree than most people. They do this by developing a sense of the conventions used in book design, and by

24 Ibid., 194.
25 Indeed, many a scholarly discussion has taken place concerning the structure of texts preserved in manuscripts where the structure-representing links were not clear because they were still evolving. See E. A. Lowe, Palaeographical papers 1907–1965 (Oxford: Clarendon Press, 1972), 1, 196–8, 266–8. The arguments over the order of the Canterbury tales, for instance, might dissolve if the work were seen as a hypertext.
26 DeRose, 'Biblical studies and hypertext', 195.
understanding the purpose of the conventions. These skills go beyond merely understanding how headings distinguish structural items. Indeed, scholars appreciate what kinds of comparisons can and cannot be made between texts, and – given one node – they can guess with reasonable accuracy how the node which might be linked to it isomorphically can be found. One does this by recognizing the sequences used in the presentation of one text and seeking them in the next; for example, a commentary on *Paradise lost* may be keyed to book and line numbers, making the location of information obvious to anyone; or it may be keyed to the narration, which represents simply a sequence of events in the mind of any Miltonist, so that he or she can easily find the node in the commentary which should be linked to a node in the poem. Indeed, the way in which we image a text in our minds allows those of us who work extensively with texts to link them quickly with any related texts requiring comparison. DeRose identifies six areas of difficulty in linking cybernetic hypertext isomorphically. In all cases, the difficulties arise from the fact that he expects cybernetic hypertext to be as flexible as the human mind in dealing with problems of comparison.27

Annotation links ‘are used to represent connections from portions of a text to information about the text’. These are, basically, footnotes in the printed tradition, but DeRose implies that he is more concerned with what we generally call ‘tags’, that is information which indicates that the text qualifies as an entity which we want to count. They can thus become ubiquitous and intrusive, requiring the software designer to provide some way of suppressing them when it is not desirable to see them.28 Like associative links, annotation links are indeed much more prevalent in cybernetic hypertext than in printed text, for the reason that both of them permit the computer to manipulate massive quantities of data, which is what it does best. Nevertheless, texts drawn from many manuscript witnesses (or from a few difficult ones) often have elaborate annotations for almost every word in the text. As few as five hundred years ago, compositors (if not scribes) devised the use of the footnote sigla, so that the annotation may be either ignored or read at the bottom of the page, thus standardizing a solution in print technology which has yet to be standardized in computational technology.

Implicit links are extremely powerful. They are links which ‘can be inferred algorithmically from elements comprising the source document’.29 In cybernetic hypertext, it is often possible to obtain a definition of any word in the text simply by causing the program to run a routine which will automatically set in motion a process to look up the word in an on-line dictionary and deliver the definition without the

27 Ibid., 196–7
28 Ibid., 197–8.
29 Ibid., 198.
word’s having been formally linked to the dictionary. Similarly, any word in an electronic text is implicitly linked to every other example of that same word in any text to which the computer has access, because finding matching data is one of the basic functions of computer logic. In printed texts, we are used to depending on implicit links. Not only do we memorize the alphabet so that we can link any dictionary or encyclopaedia to any text, but we transfer the technique to the indexes of books so that we can locate instances of a given concept or word which we expect to be implicitly linked to the information we seek, but which is not directly named in the index. For example, if there is no reference in the index to ‘the Exodus’, you might look under ‘Moses’ to provide an implicit link to whatever information the book may contain on the Exodus.

Retrieval links define a particular document or location which the author has chosen to link to a text. Whereas associative links are seen to be arbitrary links within the same document and are bi-directional (that is, one might use the link from either of the two nodes linked by it), retrieval links are unidirectional. One is directed by the link to further material to be retrieved, but nothing requires the presence of a reciprocal link to move the reader back to the original document. In other words, a cybernetic hypertext of this article would frequently lead the reader to retrieve material by Steven DeRose; were one reading DeRose’s essay, however, there would be no reciprocal links back to this essay. In print technology, standard bibliographical citations provide the information to be retrieved; thus, the texts so cited are implicitly linked to the original document which names them, although they do not reciprocate the citations. Such a link, once followed, makes no provision for the reader’s return. Such links are of limited power in printed texts, but they can be used in cybernetic hypertext to implement non-regressive branching, which can be important in building narrative structure into a hypertext without specifying all choices, in setting up hierarchies of items like graded readings for individuals learning a new language or skill, and in implementing a series of choices, as is the case with the automated bank teller noted above.

There may be other ways in which cybernetic hypertext must be able to achieve links than those DeRose has foreseen, but I have not been able to discover them. Certainly, in every case he has discussed, we find that the book (and the technology associated with using it) has devised a means to achieve the same functions. If it is true that trends

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31 The index is really a means of organizing an inventory of associative links within a book so that a reader can link a variety of nodes identified by the person making the index; the same tool, however, is a source of implicit links.

in critical theory are leading us irrevocably to a position where only hypertext can engage the ways we are now conceiving our textuality, then we must ask why we suspect that the book may not survive the developments of electronic communication and the kind of literate culture that portends if it has the potential to make access to the hypertext possible. Why can we not have a technology of reading which privileges a semiotic conception of texts and which consciously builds on developing our powers to access the intertext by means of reconceiving the value of our residual response in print to the requirements of hypertext? In other words, why defer to electronic technology, when the theoretical concepts which most concern us as readers and thinkers need not be conjoined to the development of cybernetic hypertext, but may be explored in printed media?

The answer is that this technology is irresistible, because it promises to alter the physical manifestations of space and time in which print has locked the reading process. The crucial force of technology throughout the history of the West has been centred on doing just that, on changing the relationship between space and time, whether it be applied in the areas of warfare, agriculture, commerce, architecture or recreation. However, many of these new technologies relate time and space by comparing the time expended (e.g. ‘man-hours’, to use a phallocentric term) against a quantity of space (e.g. acres ploughed, bushels produced) to assert the resultant efficiency-quotient as a measure of an improved technology. I do not think that we can argue at this point that cybernetic hypertext is likely to be more efficiently produced in the near future than masses of hard-copy texts, because the advent of personal computers and laser printers has also created ‘desktop publishing’, which provides us with extremely efficient means of presenting simple texts, which – as we have seen – can encode the same links one finds in cybernetic hypertext. But even though the creation of useful hypertextual applications may not be realized efficiently in the very near future, the chance to disengage the reading process from the restrictive control of a print technology can no more be resisted than we were able to resist releasing the auditor from the restraints of the oral production of texts, and probably for the same reasons: changing the temporal and spatial nature of our relationship to our texts promises to enhance our textuality. To illustrate, I shall explore the possibility that a node in cybernetic hypertext greatly alters the way we organize the space which contains a text. This alteration of space produces several effects on the electronic link, the most important of which are essentially temporal.

In the world of cybernetic hypertext, text is located in two places simultaneously. It is typically displayed on the computer’s monitor, where the reader may view it and perceive it in some ways similar to

the way he or she views a printed page. The technical development of both microcomputer and minicomputer monitors (which can now create black text on white backgrounds, provide a full range of colours and various fonts and stylings, and may be purchased in proportions appropriate to full-size, tabloid format pages) is an indication that hardware engineers themselves perceive the CRT screen as a substitution for the printed page. However, the text does not really reside on the screen; it resides elsewhere as a string of binary data which is translated by the computer’s central processing unit into readable screen displays. Indeed, it has to be reconstructed every time the file containing it is ‘opened’ — that is, every time a user commands the machine to translate the text from its place of residence to the screen — and every time the screen is refreshed. This notion that the computer translates the data string into a readable text is extremely important to our understanding of hypertext, because that translation process requires a new kind of encoding/decoding of the text which is different from earlier forms of textual dissemination.

One difference is that the data string has to encode much more information than has been encoded heretofore. This is best illustrated by an examination of the Text Encoding Initiative’s guidelines for encoding text which is not dependent upon specific hardware or software, but which can be translated to any machine or program. The amount of extra information to be encoded in addition to the simple alphanumeric string of characters (roughly comparable to the ‘segments’ in a phonetic transcription) is sufficiently large and complex that a formal language called SGML (Standard Generalized Markup Language) has been developed for the purpose of defining sets of mark-up tags and the ways such tags may interact.34 A second difference between the computer’s presentation of the data string on the screen and its making the text available on a printed page is that one may selectively privilege different aspects of the text or make global changes in it for the purpose of an experimental display in the former state, whereas the text resists any subsequent changes in the latter state.35

Not only is the electronic text different from the printed text in these ways, but its permanence is dependent on storage media such as a hard disk, tape, or CD-ROM, storage media which do not have to reside inside — or even next to — the same machine from whose monitor we read the text. Developments in telecommunications have made it possible for people in Buenos Aires to have nearly instantaneous access to texts stored in Helsinki. Not only, then, is the text located in two places, but those places may be located as far away from each other as communications satellites will permit.

35 Bolter, *Writing space* (see n.4), 159–60.
The link may be taken in a temporal context simply because the link is a means of presenting two nodes which exist in different spaces as if they coexisted within the same present. Electronic links do not work in the way that a highway joins two cities by means of traversing the space between them, but in a way which brings the two nodes into immediate juxtaposition—as if linking cities were not a matter of highway construction, but could be accomplished by simply pushing one city next to (or even on top of) another for a while. The illusion of juxtaposition which electronic links support in hypertext is responsible for the reader's sense of the text's continuous presence in the present. Whenever a link is activated, the next node is brought to the monitor's screen just as turning a page in a book brings another page into view. However, the signal difference is that, while every page in a book is predetermined by the author (and the compositor) to be followed by another specific page, the next page in a hypertext depends upon the link established by the reader. No hypertext 'page' ever need succeed any other page. In fact, since what we see on the screen is really a matter of the management of data contained elsewhere, it seems fair to characterize hypertexts, in print terms, as being limited to the present page and the action of turning it. When the computer overwrites a screen (or 'window'), then it is an illusion that we can return to that screen, in the ordinary sense of the word 'return'. In fact, it has to be reconstituted from the data stream, exactly as if it were being opened for the first time.36 For that reason, there is really only the present page and the action of turning it, which leads to the present page; there is no sense of the text as a mass of material bounded by boards wherein the reader's 'place' can be located at some point in space, as there is with the printed book.37

Such imminence or simultaneity of the text is the most significant contribution of cybernetic hypertext technology to the evolution of human textuality, because it solves a major problem caused by print technology in presenting our textuality, and it adds a dimension to the intertext which no oral society could ever have added. The problem caused by print technology in presenting our textuality is the problem of the artefactual predicament. That is, the text has been embodied in a book so that the physical constraints proper to objects are improperly

36 The illusory nature of the text is further complicated by the fact that the text exists in varying degrees of permanence; changes made on the screen but not saved to disk have no permanence outside the CPU's random-access memory (RAM), and an interruption in power will usually cause them to be lost. Even less permanent are the latest changes made to the text, which may, with an 'undo' command, be reversed, although subsequent changes render them at least as permanent as any other part of the unsaved text. The act of 'saving' a text merely means that it has been inscribed into a medium which does not require electrical current to maintain it, although it does require electrical power to give either author or reader access to it again.

37 This is not to ignore or devalue the web, which new readers have to have, and which experienced readers of hypertext depend upon in different ways. But these are analogs to help us in the digital world. See G. Landow, 'The rhetoric of hypermedia: some rules for authors', in Hypermedia and literary studies (see n.15), 83–96.
transferred to the text itself. Indeed the major conflict among editors of literary texts of the last one hundred years has focused on the material nature of the text: are we to accept – as the Lachmannian position has it – that all texts have evolutionary histories, like the plastic arts and entities in the natural world, or should we believe that a single, material manifestation of the text – the ‘best text’, as the Bédier school expresses it – is to be enshrined as the fundamental version of the text? The simultaneity of the text in cybernetic hypertext solves the problem of having to reduce a text to a single, material manifestation by allowing all variants and variations to be linked as nodes, and even processed into the text, so that one can reproduce any version of the text one wishes, even versions which have no material existence, like ‘lost’ exemplars or projected revisions.

The dimension which cybernetic hypertext adds to the idea of the intertext is the global dimension. The intertext of an oral culture is necessarily limited by the society which orally preserves it. It is essentially a ‘tribal’ memory. But because cybernetic hypertext is not dependent upon the memory of a nation or a race, it need not limit itself to such tribal intertexts when it can offer a window on the whole human intertext. While individuals may not be able to master all of the languages and cultural attitudes needed to range throughout the whole intertext, we should, nevertheless, be able to move into those texts on the boundaries of our own tribal experiences. European-American texts which deal with American Indians, for example, might be linked, on the one hand, to texts from all over the world which deal with interactions between Europeans and colonized native cultures, and linked, on the other hand, to texts produced by American Indians themselves. Many such coalitions would eventually provide links throughout the range of human textuality. Thus, hypertext is open-ended and decentralised. It is also finite, but its definitions are not those of time and space; they are rather those of politics, the boundaries of access and of control. It is possible (and frighteningly probable) that we shall in the future insist on limiting our textual space and its access to others just as we have our living space.

Examples of a concern with such restraints include the attitudes of those editors who eschew emending the text under any circumstances. See M. Lapidge, 'Textual criticism and the literature of Anglo-Saxon England', Bulletin of the John Rylands University Library of Manchester, 73 (1991), 41–5.

Such hypothetical texts will only be as good as the hypotheses on which they are based, of course, but they may lead us to a new editing technology which I would call 'textual simulation' Such a discipline would begin with the assumption that its productions do not exist, but that their creation may reflect texts which could have existed under the stated conditions of the hypothesis.

See J. Amato, 'A re/view of Bolter’s Writing space,' EJournal 1 (1991), file EJRNL V1N2. This article can be obtained via E-mail by sending the command GET EJRNL V1N2 to the address LISTSERV @ ALBNYVMS.BITNET (or consult a computer advisory service).
PROSPECTS

Where we can go with the concept of hypertext, having defined it and having developed the technology to deliver it, is unclear. It may signify the rebuilding of a kind of textuality which was lost when printed books began to be considered more authoritative than oral narrative, and it may triumph – as Rome did over Athens – more completely and globally than Homer or any other signification of an oral textuality could have imagined.

On the other hand, a widespread commitment to extensive databases of electronic texts may force us to reconsider how we learn and how we know what we have learned. If Ong is right – and I believe that he is – in saying that there is residual orality encoded into the very narratives we think of as literate constructs, then we may expect that the pattern will repeat itself and there will be a residual ‘bookness’ encoded into hypertexts. The notion of the book is as difficult a notion to abandon as hypertext is irresistible to embrace.

We may imagine a direct line of textual development. Literate text was dependent on oral text, and hypertext is dependent on literate text. It will not do to argue that the strength of hypertext over other kinds of text is that it offers the manifold possibilities of ‘hypermedia’. Of course it does, but the visual and aural media implied in the term ‘hypermedia’ are simply the means by which cybernetic hypertext is illustrated. These things are unlikely to change the way we read, whereas hypertext itself will lead us into very different ways of reading. As we have seen, readers can read from conventional books as if they were moving through the stacked nodes of a complex hypertext. The question, therefore, is whether the machine form of hypertext can ever hope to model so complex an activity as the reading process to the degree that it can revolutionize it instead of simply enhancing the process. I wrote above near the beginning of this article:

Even so promising a technology for the representation of early hypertexts as we find in the great Bible codices or Glossa ordinaria which provided extensive commentary in complex ruled margins linked to scripture in the middle of the page – a form of presentation common throughout the Middle Ages – seems to have exerted little influence on the development of modern page layouts and book design, not because the practice could not be imitated in the print shop (it could and it was), but because the mode of textuality it represented – that is, incipient hypertext – was associated with an outmoded past which did not realize the strength of the printed word.

Is it possible that hypertext is now too strongly identified with futuristic concepts which we might provisionally label ‘hyperliteracy’ or ‘hypertextuality’? These signify a hegemonic project which we

might imagine could harness and control all human textuality. Will the purveyors and users of hypertext, in a fit of ideological pique, suggest the banishment of the book as we know it in the way that Plato wanted to keep the poets out of his Republic, because— as Eric Havelock has explained— oral formulaic discourse was antithetical to the world of new ideas by its very traditional essence? Will we privilege the idea of linking texts into larger texts, so that there will be no place for the unlinked text, for the single volume, the printed book as we now know it?

The answer, of course, is no. Books provide tangible dimensions to our textuality which cybernetic hypertexts will not be able to match. They are, and will remain, the model of the material text.

The material nature of the written text has been responsible for many of the differences between oral and written text, because the written signifier has to be made permanent in order to preserve the text it encodes. Of course, electronic text resides materially on some sort of a storage device, but it requires hardware to make the text accessible, and that accessibility is a matter of electrical impulses. Thus, electronic text does not appear to have any materiality. Except for a very few people who revel in the unfamiliar, most users of electronic texts in any form will need to find ways to translate the seemingly insubstantial nature of their texts into the familiar substance of the book. Because electronic texts feed a larger, more archival structure which we have called hypertext, then hypertexts, too, will have to find analogies to the material forms of books. Terms including ‘pages’, ‘files’, ‘documents’ and ‘volumes’ have already been used in computational jargon for quite some time now to signify units of data, the ‘volume’ representing the whole of a particular storage area available at any one time to the computer’s central processing unit (CPU), such as a disk in the floppy drive or a hard disk. This language of the book will continue to translate the unfamiliar technology of cybernetic hypertext to our world of textuality, in the same way that narrative structures have survived from the world of orality to inform and control the development of written texts. The situation is analogous to the way that the automobile has appropriated the language of horse-drawn transportation: one drives an automobile just as one drives horses—indeed, one drives a car, which itself developed from the carriage. Similarly, airplanes, which replaced ships, are piloted, have navigators, and were served until recently by stewards.

42 Ibid., 167–8.
43 J. Derrida, Of grammatology, trans. G.C. Spivak (Baltimore, Md.: Johns Hopkins U.P., 1977), 43–4, demonstrates, in examining F. Saussure’s work, that ‘phonocentrism’ or privileging the techniques of oral production of a language over the techniques of written production, has controlled and restricted the examination of how language may be grounded in writing and how writing may be grounded in language.
and stewardesses. The history of both automotive and airplane travel can be recounted in terms of the degree to which the requirements of carriage and ocean-liner modes of travel have reduced the role they play in the ontogeny of their respective replacements, and it is quite clear that the ontogeny of hypertext will recapitulate the phylogeny of textuality, too. Hypertext will thus embrace the language of talking about books for an obvious reason: without the analogy of the book on which to base its development, we would have to stand back and watch while technicians redefined our textuality and then wait until they taught it to us anew. Henry Ford made automobiles; he did not teach driving, but driving developed as the functions of horse-drawn vehicles were usurped by motorized vehicles, and those who had controlled wagons began to control these new conventions, 'driving' them along the same roads, carrying the same loads, and taking over the same semantic and social spaces.

Books will be translated into electronic form, but they will still be books to many of us even though they will do things and go places no book has ever done or gone before; they will be identified with the language we have always used with books and they will both perform the same functions and, through such matters as copyright law, authorial attribution, publication profits, and various ideological dimensions, perpetuate many of the same limitations we have evolved and long accepted in print technologies. We shall only very slowly change the attitudes which will inscribe books into hypertext, and only after the evolution of the latter has been largely determined by the former. We can promise that there will always be books, but just as the printing press demanded a new foundation for the text, one more suited by surface uniformity and ink absorption rates to the nature of printing, so paper will give way to magnetic encoding. The last days of the book, then, will not come to one last, final day for, to paraphrase a slogan from a different reformation, new hypertext is just old book, writ large.

ABOUT THE AUTHOR

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44 A desire to expunge gender-marked language has led, at least in the United States, to the term 'cabin attendants' for this function. But now that air travel has developed its own style and protocols, we may be surprised to note that the word 'cabin' continues the habitual inscribing of ship transportation into the language of passenger transportation by air.

45 In the United States, at least, we used to speak of 'motoring' as a synonym for 'driving', but the word has become decidedly old-fashioned, probably because the passing of horse-drawn vehicles has destroyed most of the difference between the two terms, and the more familiar term has dominated the semantic field.
ANSAXNET, an on-line discussion list for early medievalists, and the creator of the Beowulf Workstation, which allows students to study and translate Beowulf in a hypertext environment. He is currently working on a study of the application of computing techniques to problems in English literary history.

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