Hypertext 3.0

Critical Theory and
New Media in an Era of
Globalization

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Preface

Why Hypertext 3.0? When I wrote *Hypertext 2.0* in 1997, the need was obvious: developments in hardware and software since the appearance of the first version led me to remove most references to Intermedia, replacing them with discussions of the World Wide Web and other hypermedia systems (Storyspace, Microcosm, CD-ROM proprietary environments). In addition, I added a chapter on writing for e-space, included examples from new hypertext fiction, and so on. Since the appearance of *Hypertext 2.0*, several developments have occurred that again led to the need for a new version. These changes include (1) the enormous growth of the Web and its use in literary, business, and political applications; (2) the development of Weblogs, or blogs, as a widely available form of read-write hypertext—the first widely available Web mode that begins to approach the vision of the first hypertext theorists; (3) the rapid growth of interest in animated text, using Flash, now that enough Web users have broadband access to make such large files practicable in Internet applications; (4) the increasing importance of our understanding of postcoloniality and globalization; and (5) some first steps toward a theory of digital cinema (*Hypertext 2.0* briefly discussed this topic with emphasis on examples rather than on their theoretical implications.) To the earlier discussions of the convergence of hypertext, critical theory, and editorial theory, I also propose to consider two additional possible points of convergence, postcolonial culture and interactive cinema.

Perhaps most important, given the optimistic and even celebratory tone taken by most writers on hypermedia, has been the notorious dotcom bust, which Vincent Mosco has so effectively described in terms of its relations to cyberspace as a cultural myth. In *The Digital Sublime: Myth, Power, and*

Cyberspace (2004), he explains "the extraordinary boom-and-bust cycle" (6) of the 1990s by placing it in the context of mythic notions of cyberspace promulgated by those like Nicholas Negroponte and other proponents of "technomania" (21). According to Mosco, cyberspace functioned as one of those cultural myths that provide "stories that animate individuals and societies by providing paths to transcendence that lift people out of the banality of everyday life. They offer another reality, a reality once characterized by the promise of the sublime" (3).

> Convinced by the demise of the Cold War and the magic of a new technology, people accepted the view that history as we once knew it was ending and that, along with the end of politics as we knew it, there would be an end to the laws promulgated by that most dismal of sciences, economics. Constraints once imposed by scarcities of resources, labor, and capital would end, or at least loosen significantly, and a new economics of cyberspace (a "network economics") would make it easier for societies to grow and, especially, to grow rich . . . What made the dotcom boom a myth was not that it was false but that it was alive, sustained by the collective belief that cyberspace was opening a new world by transcending what we once knew about space, time, and economics. (4)

These "myths," Mosco argues, point "to an intense longing for a promised community, a public democracy" (15). Like all myths, they make "socially and intellectually tolerable what would otherwise be experienced as incoherence" (29) and otherwise shield people from political and economic realities (31) because they "mask the continuities that make the power we observe today, for example in the global market and in globe-spanning companies like Microsoft and IBM." Cyberspace myths, which purport to lead us to a golden future in which geography and history end, create "amnesia about old politics and older myths" (83). Mosco's solution involves valuably reminding us that during the past two centuries almost every major development of technology—electricity, telegraph, telephone, radio, television, cable television, and so on—brought with it similar mythic claims.

One of the few weaknesses in his convincing, if limited, analysis lies in the fact that it so emphasizes myth as a social construction born from a community's need that it never inquires if any of these myths about cyberspace proved to have roots in fact. Thus, although he several times assures the reader that "myths are not true or false, but living or dead" (3), in practice he always acts as if all statements about cyberspace are false. Unlike William J. Mitchell in *Me++: The Cyborg Self and the Networked City* (2003), Mosco never inquires if *some* of the claims about location-independent work, business

applications of the Internet, or hypermedia in education proved correct. After all, a great many computer-related enterprises—educational, artistic, and commercial—continue to thrive.

In fact, since I wrote the first version of *Hypertext* the situation of computing in humanities, arts, and culture has changed dramatically. When I first tried to explain the nature and possibilities of hypermedia, most of my readers had little contact with computing, but that had changed by *Hypertext 2.0.* The situation has now changed dramatically once more, and a book like this one now finds itself situated very differently within our culture, particularly the humanities, than was the case only a short time ago. For example, when I first explained the characteristics of a document within a hypertext environment, contrasting it to a page of print, I had to describe and explain three things: (1) how one used a computer—even how one used a mouse and drop-down menus; (2) the basic effects of digital information technology; and (3) the characteristic qualities and experience of hypertext itself. Such is no longer necessary, and such is no longer adequate. It is not simply a matter that many of you have become skillful users of e-mail, discussion lists, Google, and the World Wide Web. Equally important, you have experienced numerous digital applications, genres, and media that do not take the specific form of hypertext. Some of these, such as Weblogs, show a important relation to hypermedia, but others, like computer games, have only a few points of convergence with it. Still others of increasing economic, educational, and cultural importance, such as animated text, text presented in PDF (portable document format) format, and streaming sound and video, go in very different directions, often producing effects that fundamentally differ from hypermedia.

Let me emphasize here that I do not propose to evaluate nonhypertextual developments of digital information technology according to the degree to which they resemble hypertext and hypermedia. I am also not interested in presenting hypermedia as an overarching umbrella concept under which to gather all other digital forms. I shall, however, compare these other kinds of digitality to hypermedia on the assumption that doing so will help us better understand characteristic effects and applications of all these new media.

The situation—in particular, the academic standing and fashionability—of poststructuralism has also changed markedly since the first version of *Hypertext*, though in a way perhaps opposite to that of hypermedia. Whereas hypertext and other forms of digital media have experienced enormous growth, poststructuralism and other forms of critical theory have lost their centrality for almost everyone, it seems, but theorists of new media. One might claim to see a parallel between the dotcom bust and the general loss of

academic standing by critical theory, but websites, blogs, discussion lists, and new media arts flourish despite the bankruptcy of many ill-conceived computer-related businesses, some of which never managed to produce anything more than vaporware.

I don't believe this change in situation lessens the value of one of the main approaches of this book, its use of hypertext and late-twentieth-century critical theory to illuminate each other. As I stated repeatedly in the earlier versions of this book, the writings of Roland Barthes, Jacques Derrida, and other critical theorists neither caused the development of hypermedia nor coincided exactly with it. Nonetheless, their approach to textuality remains very helpful in understanding our experience of hypermedia. And vice versa. I have had many students in my hypertext and literary theory class who have told me that they found the writings of Barthes, Derrida, Michel Foucault, and Gilles Deleuze and Félix Guattari easier to understand after the experience of reading and writing hypertexts. Others have agreed that these theorists, particularly Derrida and Barthes, provide useful ways to think about hypertext.

Perhaps the single most important development in the world of hypermedia has been the steady development of read-write systems—of the kind of systems, in other words, that the pioneering theorists Vannevar Bush and Theodor H. Nelson envisioned. Blogs, wikis, and the Portal Maximizer by Active Navigation all represent attempts to bring to the Web the features found in hypertext software of the 1980s that made readers into authors.

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Because my first acquaintance with the idea of hypertext goes back to 1986 or 1987, when members of Brown University's long-vanished Institute for Research in Information and Scholarship (IRIS) recruited me to join the Intermedia project, I owe special thanks to its founding director, William G. Shipp, to its later co-directors, Norman K. Meyrowitz and Marty J. Michel, and to my friend and colleague Paul Kahn, who was project coordinator during the creation of *The Dickens Web* and later Intermedia projects and who served as the institute's final director. Nicole Yankelovich, IRIS project coordinator during the initial development and application stages of Intermedia, always proved enormously resourceful, helpful, and good humored even in periods of crisis, as did Julie Launhardt, assistant project coordinator. In the final years of the project, the late James H. Coombs, who created many of the key parts of the second stage of Intermedia, provided invaluable assistance.

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Hypertext:
An Introduction

Hypertextual Derrida,

Poststructuralist Nelson?

When designers of computer software examine the pages of *Glas* or *Of Grammatology*, they encounter a digitalized, hypertextual Derrida; and when literary theorists examine *Literary Machines*, they encounter a deconstructionist or poststructuralist Nelson. These shocks of recognition can occur because over the past several decades literary theory and computer hypertext, apparently unconnected areas of inquiry, have increasingly converged. Statements by theorists concerned with literature, like those by theorists concerned with computing, show a remarkable convergence. Working often, but not always, in ignorance of each other, writers in these areas offer evidence that provides us with a way into the contemporary *episteme* in the midst of major changes. A paradigm shift, I suggest, has begun to take place in the writings of Jacques Derrida and Theodor Nelson, Roland Barthes and Andries van Dam. I expect that one name in each pair will be unknown to most of my readers. Those working in computing will know well the ideas of Nelson and van Dam; those working in literary and cultural theory will know equally well the ideas of Derrida and Barthes.[1]

All four, like many others who write on hypertext and literary theory, argue that we must abandon conceptual systems founded on ideas of center, margin, hierarchy, and linearity and replace them by ones of multilinearity, nodes, links, and networks. Almost all parties to this paradigm shift, which marks a revolution in human thought, see electronic writing as a direct response to the strengths and weaknesses of the printed book, one of the major landmarks in the history of human thought. This response has profound implications for literature, education, and politics.

The many parallels between computer hypertext and critical theory have many points of interest, the most important of which, perhaps, lies in the fact that critical theory promises to theorize hypertext and hypertext promises to embody and thereby test aspects of theory, particularly those concerning textuality, narrative, and the roles or functions of reader and writer. Using hypertext, digital textuality, and the Internet, students of critical theory now have a laboratory with which to test its ideas.[2] Most important, perhaps, an experience of reading hypertext or reading with hypertext greatly clarifies many of the most significant ideas of critical theory. As J. David Bolter points out in the course of explaining that hypertextuality embodies poststructuralist conceptions of the open text, "what is unnatural in print becomes natural in the electronic medium and will soon no longer need saying at all, because it can be shown" (*Writing Space*, 143).

The Definition of Hypertext and

Its History as a Concept

In *S/Z*, Roland Barthes describes an ideal textuality that precisely matches that which has come to be called *computer hypertext*—text composed of blocks of words (or images) linked electronically by multiple paths, chains, or trails in an open-ended, perpetually unfinished textuality described by the terms *link, node, network, web,* and *path.* "In this ideal text," says Barthes, "the networks [*réseaux*] are many and interact, without any one of them being able to surpass the rest; this text is a galaxy of signifiers, not a structure of signifieds; it has no beginning; it is reversible; we gain access to it by several entrances, none of which can be authoritatively declared to be the main one; the codes it mobilizes extend *as far as the eye can reach,* they are indeterminable . . . ; the systems of meaning can take over this absolutely plural text, but their number is never closed, based as it is on the infinity of language" (5–6 [English translation]; 11–12 [French]).

Like Barthes, Michel Foucault conceives of text in terms of network and links. In *The Archaeology of Knowledge,* he points out that the "frontiers of a book are never clear-cut," because "it is caught up in a system of references to other books, other texts, other sentences: it is a node within a network . . . [a] network of references" (23).

Like almost all structuralists and poststructuralists, Barthes and Foucault describe text, the world of letters, and the power and status relations they involve in terms shared by the field of computer hypertext. *Hypertext,* a term coined by Theodor H. Nelson in the 1960s, refers also to a form of electronic text, a radically new information technology, and a mode of publication.[3] "By 'hypertext,'" Nelson explains, "I mean non-sequential writing—text that

branches and allows choices to the reader, best read at an interactive screen. As popularly conceived, this is a series of text chunks connected by links which offer the reader different pathways" (*Literary Machines,* 0/2). *Hypertext,* as the term is used in this work, denotes text composed of blocks of text— what Barthes terms a *lexia*—and the electronic links that join them.[4] *Hyper-media* simply extends the notion of the text in hypertext by including visual information, sound, animation, and other forms of data.[5] Since hypertext, which links one passage of verbal discourse to images, maps, diagrams, and sound as easily as to another verbal passage, expands the notion of text beyond the solely verbal, I do not distinguish between hypertext and hypermedia. *Hypertext* denotes an information medium that links verbal and non-verbal information. In this network, I shall use the terms *hypermedia* and *hypertext* interchangeably. Electronic links connect lexias "external" to a work—say, commentary on it by another author or parallel or contrasting texts—as well as within it and thereby create text that is experienced as non-linear, or, more properly, as multilinear or multisequential. Although conventional reading habits apply within each lexia, once one leaves the shadowy bounds of any text unit, new rules and new experience apply.

The standard scholarly article in the humanities or physical sciences perfectly embodies the underlying notions of hypertext as multisequentially read text. For example, in reading an article on, say, James Joyce's *Ulysses,* one reads through what is conventionally known as the main text, encounters a number or symbol that indicates the presence of a footnote or endnote, and leaves the main text to read that note, which can contain a citation of passages in *Ulysses* that supposedly support the argument in question or information about the scholarly author's indebtedness to other authors, disagreement with them, and so on. The note can also summon up information about sources, influences, and parallels in other literary texts. In each case, the reader can follow the link to another text indicated by the note and thus move entirely outside the scholarly article itself. Having completed reading the note or having decided that it does not warrant a careful reading at the moment, one returns to the main text and continues reading until one encounters another note, at which point one again leaves the main text.

This kind of reading constitutes the basic experience and starting point of hypertext. Suppose now that one could simply touch the page where the symbol of a note, reference, or annotation appeared, and thus instantly bring into view the material contained in a note or even the entire other text—here all of *Ulysses*—to which that note refers. Scholarly articles situate themselves within a field of relations, most of which the print medium keeps out of sight

and relatively difficult to follow, because in print technology the referenced (or linked) materials lie spatially distant from the references to them. Electronic hypertext, in contrast, makes individual references easy to follow and the entire field of interconnections obvious and easy to navigate. Changing the ease with which one can orient oneself within such a context and pursue individual references radically changes both the experience of reading and ultimately the nature of that which is read. For example, if one possessed a hypertext system in which our putative Joyce article was linked to all the other materials it cited, it would exist as part of a much larger system in which the totality might count more than the individual document; the article would now be woven more tightly into its context than would a printed counterpart.

As this scenario suggests, hypertext blurs the boundaries between reader and writer and therefore instantiates another quality of Barthes's ideal text. From the vantage point of the current changes in information technology, Barthes's distinction between readerly and writerly texts appears to be essentially a distinction between text based on print technology and electronic hypertext, for hypertext fulfills

the goal of literary work (of literature as work) [which] is to make the reader no longer a consumer, but a producer of the text. Our literature is characterized by the pitiless divorce which the literary institution maintains between the producer of the text and its user, between its owner and its consumer, between its author and its reader. This reader is thereby plunged into a kind of idleness—he is intransitive; he is, in short, serious: instead of functioning himself, instead of gaining access to the magic of the signifier, to the pleasure of writing, he is left with no more than the poor freedom either to accept or reject the text: reading is nothing more than a referendum. Opposite the writerly text, then, is its countervalue, its negative, reactive value: what can be read, but not written: the readerly. We call any readerly text a classic text. (S/Z, 4)

Compare the way the designers of Intermedia, one of the most advanced hypertext systems thus far developed, describe the active reader that hypertext requires and creates:

Both an author's tool and a reader's medium, a hypertext document system allows authors or groups of authors to link information together, create paths through a corpus of related material, annotate existing texts, and create notes that point readers to either bibliographic data or the body of the referenced text . . . Readers can browse through linked, cross-referenced, annotated texts in an orderly but nonsequential manner. (17)[6]

To get an idea of how hypertext produces Barthes's writerly text, let us examine how the print version and the hypertext version of this book would

differ. In the first place, instead of encountering it in a paper copy, you would read it on a computer screen (or already have if you've read the Johns Hopkins translation of the first version into hypertext). In 1997, computer screens, which had neither the portability nor the tactility of printed books, made the act of reading somewhat more difficult than did the print version. For those people like myself who do a large portion of their reading reclining on a bed or couch, screens on desktop machines are markedly less convenient. For the past four years, however, I have worked with a series of laptops whose displays do not flicker and whose portability permits enjoyable reading in multiple locations. Of course, my Apple G4 laptop still doesn't endow the documents read on it with the pleasurable tactility of the printed book, but since my wife and I use wireless access to the Internet, we can both read Internet materials anywhere in the house or sitting outside in a recliner on the porch. Although I used to agree with people who told me that one could never read large amounts of text online, I now find that with these new displays I prefer to read the scholarly literature on my laptop; taking notes and copying passages is certainly more convenient. Nonetheless, back in the late 1980s, reading on Intermedia, the hypertext system with which I first worked, offered certain important compensations for its inconveniences.[7]

Reading an Intermedia, Storyspace, or World Wide Web version of this book, for example, you could change the size and even style of font to make reading easier. Although you could not make such changes permanently in the text as seen by others, you could make them whenever you wished. More important, since on Intermedia you would read this hypertext book on a large two-page graphics monitor, you would have the opportunity to place several texts next to one another. Thus, upon reaching the first note in the main text, which follows the passage quoted from *S/Z*, you would activate the hypertext equivalent of a reference mark (glyph, button, link marker), and this action would bring the endnote into view. A hypertext version of a note differs from that in a printed book in several ways. First, it links directly to the reference symbol and does not reside in some sequentially numbered list at the rear of the main text. Second, once opened and either superimposed on the main text or placed alongside it, it appears as an independent, if connected, document in its own right and not as some sort of subsidiary, supporting, possibly parasitic text.

Although I have since converted endnotes containing bibliographic information to in-text citations, the first version of *Hypertext* had a note containing the following information: "Roland Barthes, *S/Z*, trans. Richard Miller (New York: Hill and Wang, 1974), 5–6." A hypertext lexia equivalent to

this note could include this same information, or, more likely, take the form of the quoted passage, a longer section or chapter, or the entire text of Barthes's work. Furthermore, in the various hypertext versions of this book, that passage in turn links to other statements by Barthes of similar import, comments by students of Barthes, and passages by Derrida and Foucault that also concern this notion of the networked text. As a reader, you must decide whether to return to my argument, pursue some of the connections I suggest by links, or, using other capacities of the system, search for connections I have not suggested. Reading on the World Wide Web produces this kind of reading experience. The multiplicity of hypertext, which appears in multiple links to individual blocks of text, calls for an active reader.

A full hypertext system, unlike a book and unlike some of the first approximations of hypertext available—HyperCard™, Guide™, and the current World Wide Web (except for blogs)—offers the reader and writer the same environment. Therefore, by opening the text-processing program, or editor, as it is known, you can take notes, or you can write against my interpretations, against my text. Although you cannot change my text, you can write a response and then link it to my document. You thus have read the readerly text in several ways not possible with a book: you have chosen your reading path, and since you, like all readers, will choose individualized paths, the hypertext version of this book would probably take a very different form, perhaps suggesting the values of alternate routes and probably devoting less room in the main text to quoted passages. You might have also have begun to take notes or produce responses to the text as you read, some of which might take the form of texts that either support or contradict interpretations proposed in my texts.

Very Active Readers

When one considers the history of both ancient literature and recent popular culture, the figure of the reader-as-writer hardly appears at all strange, particularly since classical and neo-classical cultural theory urged neophyte authors to learn their craft by reading the masters and then consciously trying to write like them. Anyone who's taken an undergraduate survey course will know that Vergil self-consciously read and rewrote Homer, and that Dante read and rewrote both Homer and Vergil, and Milton continued the practice. Such very active readers appear throughout the past two centuries. To an important extent, *Jane Eyre* represents a very active reading of *Pride and Prejudice,* just as *North and South* and *Aurora Leigh* represent similar readings and rewritings of the two earlier texts. In fact, all four works could have been entitled "Pride and Prejudice,"

and all four present women of a supposedly lower social and economic class disciplining their men; in Victorian versions of this plot the man not only has to apologize for his shortcomings but he also has to experience major punishment—bankruptcy, severe injury, blindness, or a combination of them.

Literary scholars are quite accustomed to chains of active readings that produce such rewritings. We call it a *tradition.* We also, following Harold Bloom, call it the *anxiety of influence,* the later author challenging the earlier one. Readers of, say, *Aurora Leigh* recognize that Elizabeth Barrett Browning's novel-poem simultaneously asserts the existence of a female literary tradition while also challenging its creators, the poet's predecessors, for pride of place within that tradition.

Such aggressively active reading has proved particularly popular with postcolonial and postimperial authors. Thus Jean Rhys's *Wide Sargasso Sea* offers a very different, Caribbean reading of *Jane Eyre,* telling the story almost entirely from Bertha's point of view. We encounter the empire again writing back in Peter Carey's *Jack Maggs,* a novel told from the vantage point of the Magwitch character; in this version, which includes a Dickens-like novelist, the illegally returned convict does not die with Pip at his side: realizing what a dreadful person the Pip-character has turned out to be, Maggs returns to wealth, fatherhood, and fame in Australia. Take that, Dickens!

Given the history of high culture, one is not surprised to encounter these active readings and rewritings, but such approaches also appear in so-called genre fiction, such as detective stories and science fiction. In Japser Fforde's *The Eyre Affair,* for example, we learn how Brontë's novel received its happy ending. All the examples of such very active reading thus far belong to the upper reaches of the culture industry: major commercial firms publish them, they win prestigious prizes, and they quickly earn canonicity by being taught in universities. There are, however, large numbers of very active readers who receive little notice from the publishing and academic establishments. The wide availability of low-cost information technologies—first mimeographs and photo-offset printing and later desktop publishing and finally the World Wide Web—permitted the creation of self-published rewritings of popular entertainment, such as *Star Trek,* that first appeared in books, television, and cinema. Active readings of the popular science fiction series, Constance Penley explains, have existed since the mid-1970s.

Most of the writers and readers started off in "regular" *Star Trek* fandom, and many are still involved in it, even while they pursue their myriad activities in what is called "K/S" or "slash" fandom. The slash between K(irk) and S(pock) serves as a code to

those purchasing by mail amateur fanzines (or "zines") that the stories, poems, and artwork published there concern a same-sex relationship between the two men. Such a designation stands in contrast to "ST," for example, with no slash, which stands for action adventure stories based on the *Star Trek* fictional universe, or "adult ST," which refers to stories containing sexual scenes, but heterosexual ones only, say between Captain Kirk and Lieutenant Uhura, or Spock and Nurse Chapel. Other media male couples have been "slashed" in the zines, like Starsky and Hutch (S/H) . . . or *Miami Vice*'s Crockett and Tubbs. (137)

According to Penley, women produce most of these samizdat texts, and these readers-as-writers take "pride in having created both a unique, hybridized genre that ingeniously blends romance, pornography, and utopian science fiction and a comfortable social space in which women can manipulate the products of mass-produced culture to stage a popular debate around the issues of technology, fantasy, and everyday life" (137). As one might expect, the development of the World Wide Web has stimulated this active reading even more, and one can find all kinds of works by readers who want to write *their versions* of materials commercially published. The presence and productions of very active readers answer the critics of digital information technology who claim it cannot demonstrate any examples of cultural democratization. Whether one actually likes this or other kinds of cultural democratization is another matter.

Very active readers (or readers-as-writers) have tended to go unnoticed for several reasons. First, although some of these fanzines may have circulations as large as first novels published by prestigious publishers, they represent an underground culture of which mass media and educational institutions remain unaware. Another reason why the continuations and rewritings they produce receive little attention derives from some of the obvious qualities of print culture: like Carey's very active reading of Dickens's novel, these underground texts, even those that appear on the Internet, take the form of discrete works separated in time and space from the texts they rewrite. The Internet works, however, appear in a very different context than do the print ones. Anyone who stumbles upon any of these writings is likely to find them linked to a personal or group site containing biographies of the site owner, explanations of the imaginative world, and lists of links to similar stories. The link, in other words, makes immediately visible the virtual community created by these active readers.

How does such active reading-as-writing relate to the hypertext reader? First of all, this kind of print-based active reader encounters a supposedly dis-

crete, finished text; the reader's response—writing a new text—demonstrates that this kind of reader both accepts that fact and also does not want to accept its limitations. This active reading characterizes readers of blogs: they take an existing text and add to it, but because they write in a networked computer environment the commented-on blog, employing TrackBack, can link to the active reader's text, incorporating it into the ongoing discussion.[8]

Like blogs, by-now atypical hypertext systems that permit readers to add their own links and materials (Intermedia, Storyspace in the authoring environment) or even websites that solicit reader contributions represent ways that readers can assume the role of authors. All of these forms of active reading differ from the experience of the hypertext reader in read-only systems, whose writing takes the form not of adding new texts but of establishing an order of reading in an already-written set of texts. Readers of large bodies of informational hypermedia create the document they read from the informed choices they make. It might appear that such is rarely true of readers of fictional hypertexts who may not know where particular links lead. Nonetheless, the best hyperfictions, I submit, permit the reader to deduce enough basic information, sometimes, as in Michael Joyce's *afternoon,* by retracing their steps, to make informed (thus creative) decisions when they arrive at links. Still, no matter how much power readers have to choose their ways through a hypertext, they never obtain the same degree of power—or have to expend as much effort—as those who write their texts in response to another's.

Vannevar Bush and the Memex

Writers on hypertext trace the concept to a pioneering article by Vannevar Bush in a 1945 issue of *Atlantic Monthly* that called for mechanically linked information-retrieval machines to help scholars and decision makers faced with what was already becoming an explosion of information. Struck by the "growing mountain of research" that confronted workers in every field, Bush realized that the number of publications had already "extended far beyond our present ability to make real use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships" (17–18). As he emphasized, "there may be millions of fine thoughts, and the account of the experience on which they are based, all encased within stone walls of acceptable architectural form; but if the scholar can get at only one a week by diligent search, his syntheses are not likely to keep up with the current scene" (29).

According to Bush, the main problem lies with what he termed "the mat-

ter of selection"—information retrieval—and the primary reason that those who need information cannot find it lies in turn with inadequate means of storing, arranging, and tagging information:

> Our ineptitude in getting at the record is largely caused by the artificiality of systems of indexing. When data of any sort are placed in storage, they are filed alphabetically or numerically, and information is found (when it is) by tracing it down from subclass to subclass. It can be in only one place, unless duplicates are used; one has to have rules as to which path will locate it, and the rules are cumbersome. Having found one item, moreover, one has to emerge from the system and re-enter on a new path. (31)

As Ted Nelson, one of Bush's most prominent disciples, points out, "there is nothing wrong with categorization. It is, however, by its nature transient: category systems have a half-life, and categorizations begin to look fairly stupid after a few years . . . The army designation of 'Pong Balls, Ping' has a certain universal character to it" (*Literary Machines,* 2/49). According to Bush and Nelson, then, one of the greatest strengths of hypertext lies in its capacity of permitting users to find, create, and follow multiple conceptual structures in the same body of information. Essentially, they describe the technological means of achieving Derrida's concept of decentering.

In contrast to the rigidity and difficulty of access produced by present means of managing information based on print and other physical records, one needs an information medium that better accommodates the way the mind works. After describing present methods of storing and classifying knowledge, Bush complains, "The human mind does not work that way" ("As We May Think," 31) but by association. With one fact or idea "in its grasp," the mind "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" (32).

To liberate us from the confinements of inadequate systems of classification and to permit us to follow natural proclivities for "selection by association, rather than by indexing," Bush therefore proposes a device, the "memex," that would mechanize a more efficient, more human, mode of manipulating fact and imagination. "A memex," he explains, "is a device in which an individual stores 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" (32). Writing in the days before digital computing (the first idea for a memex came to him in the mid-1930s), Bush conceived of his device as a desk with translucent screens, levers, and motors for rapid searching of microform records.

In addition to thus searching and retrieving information, the memex also permits the reader to "add marginal notes and comments, taking advantage of one possible type of dry photography, and it could even be arranged so that [an individual] can do this by a stylus scheme, such as is now employed in the telautograph seen in railroad waiting rooms, just as though he had the physical page before him" (33). Two things demand attention about this crucial aspect of Bush's conception of the memex. First, he believes that while reading, one needs to append one's own individual, transitory thoughts and reactions to texts. With this emphasis Bush in other words reconceives reading as an active process that involves writing. Second, his remark that this active, intrusive reader can annotate a text "just as though he had the physical page before him" recognizes the need for a conception of a virtual, rather than a physical, text. One of the things that is so intriguing about Bush's proposal is the way he thus allows the shortcomings of one form of text to suggest a new technology, and that leads, in turn, to an entirely new conception of text.

The "essential feature of the memex," however, lies not only in its capacities for retrieval and annotation but also in those involving "associative indexing"—what present hypertext systems term a *link*—"the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another" (34). Bush then provides a scenario of how readers would create "endless trails" of such links:

When the user is building a trail, he names it, inserts the name in his code book, and taps it out on his keyboard. Before him are the two items to be joined, projected onto adjacent viewing positions. At the bottom of each there are a number of blank code spaces, and a pointer is set to indicate one of these on each item. The user taps a single key, and the items are permanently joined. In each code space appears the code word. Out of view, but also in the code space, is inserted a set of dots for photocell viewing; and on each item these dots by their positions designate the index number of the other item. Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space. (34)

Bush's remarkably prescient description of how the memex user creates and then follows links joins his major recognition that trails of such links themselves constitute a new form of textuality and a new form of writing. As he explains, "when numerous items have been thus joined together to form a trail . . . it is exactly as though the physical items had been gathered together from widely separated sources and bound together to form a new book." In fact, "it is more than this," Bush adds, "for any item can be joined into

numerous trails" (34), and thereby any block of text, image, or other information can participate in numerous books.

These new memex books themselves, it becomes clear, are the new book, or one additional version of the new book, and, like books, these trail sets or webs can be shared. Bush proposes, again quite accurately, that "wholly new forms of encyclopedias will appear, ready-made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified" (35). Equally important, individual reader-writers can share document sets and apply them to new problems.

Bush, an engineer interested in technical innovation, provides the example of a memex user

studying why the short Turkish bow was apparently superior to the English long bow in the skirmishes of the Crusades. He has dozens of possibly pertinent books and articles in his memex. First he runs through an encyclopedia, finds an interesting but sketchy article, leaves it projected. Next, in a history, he finds another pertinent item, and ties the two together. Thus he goes, building a trail of many items. Occasionally he inserts a comment of his own, either linking it into the main trail or joining it by a side trail to a particular item. When it becomes evident that the elastic properties of available materials had a great deal to do with the bow, he branches off on a side trail which takes him through textbooks on elasticity and tables of physical constants. He inserts a page of longhand analysis of his own. Thus he builds a trail of his interest through the maze of materials available to him. (34–35)

And, Bush adds, his researcher's memex trails, unlike those in his mind, "do not fade," so when he and a friend several years later discuss "the queer ways in which a people resist innovations, even of vital interest" (35), he can reproduce his trails created to investigate one subject or problem and apply them to another.

Bush's idea of the memex, to which he occasionally turned his thoughts for three decades, directly influenced Nelson, Douglas Englebart, Andries van Dam, and other pioneers in computer hypertext, including the group at the Brown University's Institute for Research in Information and Scholarship (IRIS) who created Intermedia. In "As We May Think" and "Memex Revisited" Bush proposed the notion of blocks of text joined by links, and he also introduced the terms *links, linkages, trails,* and *web* to describe his new conception of textuality. Bush's description of the memex contains several other seminal, even radical, conceptions of textuality. It demands, first of all, a radical reconfiguration of the practice of reading and writing, in which both activities draw closer together than is possible with book technology. Second,

despite the fact that he conceived of the memex before the advent of digital computing, Bush perceives that something like virtual textuality is essential for the changes he advocates. Third, his reconfiguration of text introduces three entirely new elements—associative indexing (or links), trails of such links, and sets or webs composed of such trails. These new elements in turn produce the conception of a flexible, customizable text, one that is open— and perhaps vulnerable—to the demands of each reader. They also produce a concept of multiple textuality, since within the memex world texts refers to individual reading units that constitute a traditional "work," those entire works, sets of documents created by trails, and perhaps those trails themselves without accompanying documents.

Perhaps most interesting to one considering the relation of Bush's ideas to contemporary critical and cultural theory is that this engineer began by rejecting some of the fundamental assumptions of the information technology that had increasingly dominated—and some would say largely created— Western thought since Gutenberg. Moreover, Bush wished to replace the essentially linear fixed methods that had produced the triumphs of capitalism and industrialism with what are essentially poetic machines—machines that work according to analogy and association, machines that capture and create the anarchic brilliance of human imagination. Bush, we perceive, assumed that science and poetry work in essentially the same way.

Forms of Linking, Their Uses and Limitations

Before showing some of the ways this new information technology shares crucial ideas and emphases with contemporary critical theory, I shall examine in more detail the link, the element that hypertext adds to writing and reading.[9] The very simplest, most basic form of linking is unidirectional lexia to lexia (Figure 1). Although this type of link has the advantage of requiring little planning, it disorients when used with long documents, since readers do not know where a link leads in the entered document. It is best used, therefore, for brief lexias or in systems that use card metaphors.

Next in complexity comes bidirectional linking of two entire lexias to one another—identical to the first form except that it includes the ability to retrace one's steps (or jump). Its advantage lies in the fact that by permitting readers to retrace their steps, it creates a simple but effective means of orientation. This mode seems particularly helpful when a reader arrives at a lexia that has only one or two links out, or when readers encounter something, say, a glossary definition or image, that they do not want to consult at that point in their reading.

Lexia to Lexia Unidirectional

Advantage: simple, requires little planning.

Disadvantage: disorients when used with long documents, since readers do not know where link leads; best used for brief lexias or in systems that use card metaphor.
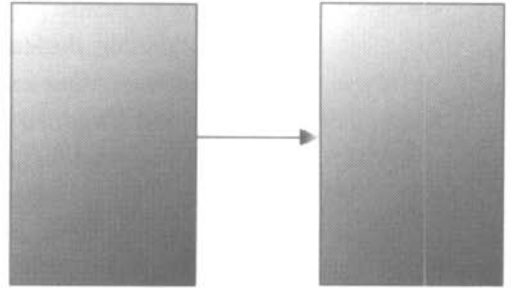
Lexia to Lexia Bidirectional

Advantage: by permitting readers to retrace their steps creates simple but effective means of orientation. Particularly helpful when arriving at lexias that have only one or two departure links.
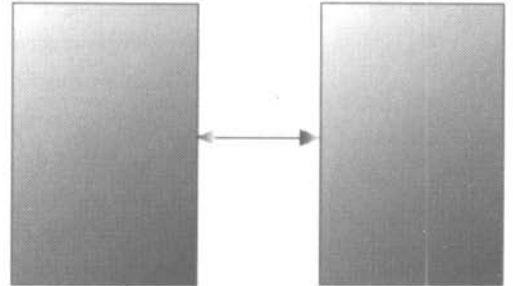
String (word or phrase) to Lexia

Advantages: (1) allows simple means of orienting readers; (2) permits longer lexias; (3) encourages different kinds of annotation and linking.

Disadvantage: disorients when used with long documents, since readers do not know where link leads; best used for brief lexias or in systems that use card metaphor.
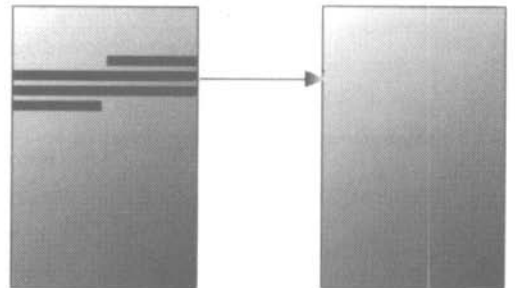
Figure 1. Three Forms of Linking

Linking a string—that is, word or phrase—to an entire lexia, the third form of linking, has three advantages. First, it permits simple means of orienting readers by allowing a basic rhetoric of departure (Figure 1). When readers see a link attached to a phrase, such as "Arminianism" or "Derrida," they have a pretty good idea that such a link will take them to information related in some obvious way to those names. Second, because string-to-lexia linking thus provides a simple means of helping readers navigate through information space, it permits longer lexias. Furthermore, since one can choose to leave the lexia at different points, one can comfortably read through longer

texts. Third, this linking mode also encourages different kinds of annotation and linking, since the ability to attach links to different phrases, portions of images, and the like allows the author to indicate different kinds of link destinations. One can, for example, use icons or phrases to indicate that the reader can go to, say, another text lexia, one containing an illustration, bibliographical information, definitions, opposing arguments, and so forth.

The difficulties with string-to-lexia links, the form most characteristic of links in World Wide Web documents, arise in problems encountered at the destination lexia. Readers can find themselves disoriented when entering long documents, and therefore string-to-lexia linking works best with brief arrival lexia. The fourth form of linking occurs when one makes the link joining a string to an entire lexia bidirectional. (Most linking in HTML [HyperText Markup Language] documents takes this form in effect—"in effect," because the return function provided by most browsers creates the effect of a bidirectional link.)

The fifth form, unidirectional string-to-string linking, has the obvious advantage of permitting the clearest and easiest way to end links and thereby create a rhetoric of arrival. By bringing readers to a clearly defined point in a text, one enables them to perceive immediately the reason for a link and hence to grasp the relation between two lexias or portions of them. Readers know, in other words, why they have arrived at a particular point. The anchor feature in HTML, which is created by the <a name> tag, thus permits authors to link to a specific section of long document. The possible disadvantage of such a mode to authors—which is also a major advantage from the reader's point of view—lies in the fact that it requires more planning, or at least, more definite reasons for each link. Making such links bidirectional, our sixth category, makes navigating hyperspace even easier.

Full hypertextuality in a reading environment depends, I argue, on the multisequentiality and the reader choices created not only by attaching multiple links to a single lexia but by attaching them to a single anchor or site within a single lexia. A fully hypertextual system (or document) therefore employs a seventh form, one-to-many linking—linking that permits readers to obtain different information from the same textual site (Figure 2). One-to-many linking supports hypertextuality in several ways. First, it encourages branching and consequent reader choice. Second, attaching multiple links to a single text allows hypertext authors to create efficient overviews and directories that serve as efficient crossroad documents, or orientation points, that help the reader navigate hyperspace. Multiple overviews or sets of overviews have the additional advantage of easily permitting different authors to pro-

String to String

Advantage: permits clearest way to end links.

Disadvantage: requires more planning than do links to full lexias.
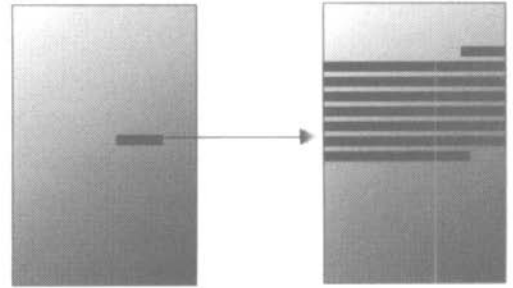
One-to-Many

Advantages: (1) encourages branching and consequent reader choice; (2) permits efficient author-generated overview and directory documents; (3) when combined with systems that provide link menus and other preview functions, helps greatly in orienting readers.

Disadvantage: can produce sense of an atomized text.
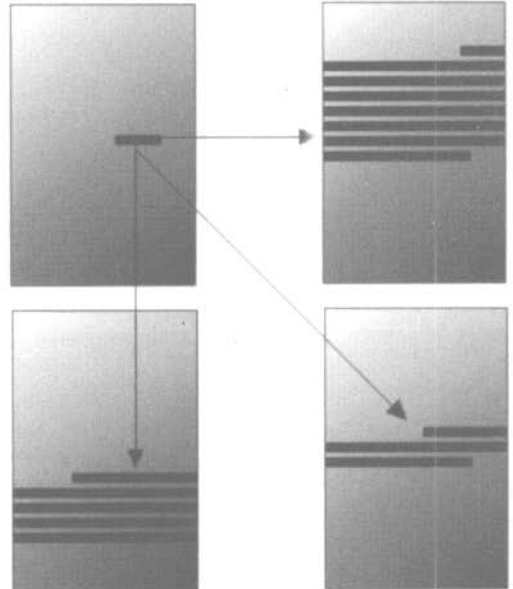
Figure 2. Two Forms of Linking

vide multiple ways through the same information space. Third, when combined with software, such as Microcosm, Storyspace, or Intermedia, that provides link menus and other so-called preview functions, one-to-many linking greatly helps in orienting readers. The major disadvantage of this kind of link, which plays a major role in most hypertext fiction, lies in its tendency to produce a sense of atomized text.

The eighth kind of link—many-to-one linking—proves particularly handy for creating glossary functions or for creating documents that make multiple references to a single text, table, image, or other data (Figure 3). DynaText,

Many-to-One Linking

Advantages: (1) handy for glossary functions or for texts that make multiple references to a single text, table, image, or other data; (2) encourages efficient reuse of important information; (3) allows simple means of producing documents for readers with differing levels of expertise.

Disadvantage: systems that create many-to-one linking automatically can produce a distracting number of identical links.
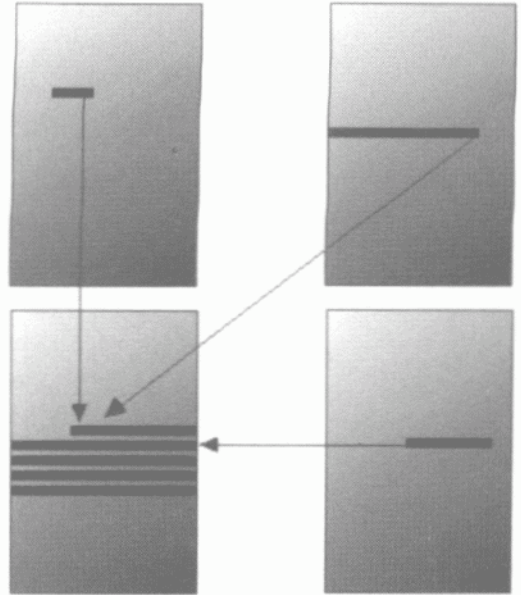
Figure 3. Many-to-One Linking

Microcosm, and the World Wide Web exemplify hypertext environments in which one can have many links lead to a single document, an arrangement that has major advantages in educational and informational applications. In particular, many-to-one linking encourages efficient reuse of important information. For example, having once created an introductory essay on, say, Charles II, Lamarckianism, or Corn Law agitation, the original (and later) authors simply use linking to provide access to it as the occasion arises. Furthermore, by providing an easy, efficient means of offering readers glossaries and other basic information, many-to-one linking also permits webs to be used easily by readers with differing levels of expertise.

The major disadvantage of such linking involves not the links themselves but the means various systems use to indicate their presence. Systems that create many-to-one linking, particularly those that create it automatically, can produce a distracting number of link markers. The World Wide Web uses colored underlining to indicate hot text (link anchors), and in the DynaText version of the first version of this book, Paul Kahn chose red text to signify the presence of links. In both cases the reader encounters distracting markup intruding into the text. Experience with these systems quickly convinces one of

the need for a means of easily turning on and off such link indicators, such as one can do in Eastgate System's Storyspace. The disadvantages with many-to-one links derive not from this form of linking itself but from other aspects of individual hypertext environments, and any such disadvantages become amplified by the inexperience of readers: in the first years of the Web, for example, authors and designers generally agreed that users, many of whom had little experience with computing, required colored underlining to find links; otherwise, it was correctly reasoned, readers would not know what to do. In the very earliest days of the Web, in fact, one often encountered linked underlined text immediately beneath a linked icon because web designers knew that many neophyte users would not realize they could follow links by clicking on the icon. As people began to use the Web every day, however, they recognized that when they moved a cursor across the surface of a web browser, it changed from an arrow to a hand when placed over a link. Experienced users thus no longer required the once ubiquitous blue underlining, and many sites now do not use it.

As we shall observe shortly, some systems, such as Microcosm, include a particularly interesting and valuable extension of many-to-one linking that permits readers to obtain a menu containing two or more glossary or similar documents. While creating a hypertext version of my book on Holman Hunt and Pre-Raphaelite painting for the World Wide Web, an environment that does not permit either link menus or one-to-many links, I had to choose whether to link (connect) multiple mentions of a particular painting, say, the artist's *Finding of the Saviour in the Temple*, to an introductory discussion of the picture or to an illustration of it. In contrast, while creating a hypertext version of the same book in Microcosm, I easily arranged links so that when readers follow them from any mention of the painting, they receive a menu containing titles of the introductory text and two or more illustrations, thereby providing readers with convenient access to the kind of information they need when they need it (see Figure 6).

Typed links, our ninth category, take the form of limiting an electronic link to a specific kind of relationship, such as "exemplifies," "influences," "contrary argument," "derives from" (or "child of"), and so on (Figure 4). Software that includes such link categorization range from proposed research systems that, in attempting to help organize argument, permit only certain kinds of connections, to those like Marc and Jocelyne Nanard's MacWeb, which allows authors to create their own categories. In fact, any system, such as Intermedia, Storyspace, or Microcosm, that permits one to attach labels to individual links allows one to create typed links, since labels permit authors

Typed Links

Advantages: (1) if clearly labeled, acts as a form of link preview and aids reader comfort; (2) can produce different kinds of link behavior, including pop-up windows.

Disadvantage: can clutter reading area or confuse by producing too many different actions when one follows links.
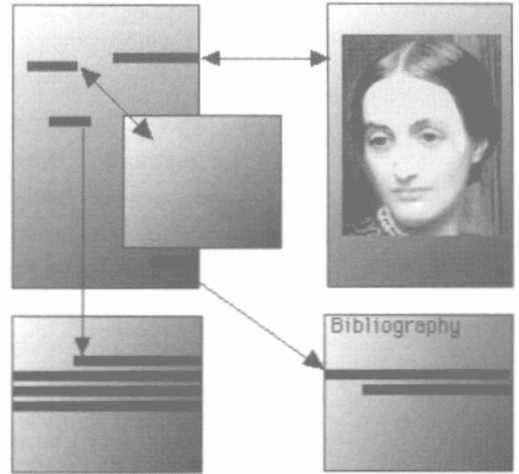
Figure 4. Typed Links

to indicate everything from document type (essay, illustration, statistics, time-line) to a particular path or trail of links that overlay a number of lexias. In fact, as the experience of the World Wide Web reveals, one can use icons or text to create what are essentially typed icons even when the system makes no provision for them. Thus, one can make clear (as I have in the *Victorian Web*) that a link leads to bibliographical information, an illustration, or an opposing argument by simply linking to a word, such as *source* or *illustration*, within parentheses.

The advantage of typed links includes the fact that, when clearly labeled, they offer a generalized kind of previewing that aids reader comfort and helps navigating information space. Such labeling can take the form of icons in the current lexia (DynaText, Voyager Expanded Book, World Wide Web), similar indications in a second window (Intermedia's Web View and similar dynamic hypergraphs, such as that created experimentally for Microcosm), and dynamic link menus (Intermedia, Storyspace). In systems that include pop-up windows overlaying the current lexia (DynaText, the proprietary one created by Cognitive Systems for the Microsoft Art Gallery, and ones created by Java for the World Wide Web), typed links can also produce different kinds of link behavior. A potential disadvantage for readers of the typed link might be confusion produced when they encounter too many different actions or kinds of information; in fact, I have never encountered hypertexts with these problems, but I'm sure some might exist. A greater danger for authors would

exist in systems that prescribe the kind of links possible. My initial skepticism about typing links arose in doubts about the effectiveness of creating rules of thought in advance and a particular experience with Intermedia. The very first version of Intermedia used by faculty developers and students differentiated between annotation and commentary links, but since one person's annotation turned out to be another's commentary, no one lobbied for retaining this feature, and IRIS omitted it from later versions.

An equally basic form of linking involves the degree to which readers either activate or even create links. In contemporary hypertext jargon, the opposition is usually phrased as a question of whether links are author or wreader determined, or—putting the matter differently—whether they are hard or soft. Most writing about hypertext from Bush and Nelson to the present assumes that someone, author or reader functioning as author, creates an electronic link, a so-called hard link. Recently, workers in the field, particularly the University of Southampton's Microcosm development group, have posed the question, "Can one have hypertext 'without links'?"—that is, without the by-now traditional assumption that links have to take the form of always-existing electronic connections between anchors. This approach takes the position that the reader's actions can create on-demand links. In the late 1980s when the first conferences on hypertext convened, such a conception of hypertext might have been difficult, if not impossible, to advocate, because in those days researchers argued that information retrieval did not constitute hypertext, and the two represented very different, perhaps opposed, approaches to information. Part of the reason for such views lay in the understandable attempts of people working in a new field in computer science to distinguish their work—and thereby justify its very existence—from an established one. Although some authors, such as the philosopher Michael Heim, perceived the obvious connection between the active reader who uses search tools to probe an electronic text and the active reader of hypertext, the need of the field to constitute itself as a discrete specialty prompted many to juxtapose hypertext and information retrieval in the sharpest terms. When the late James H. Coombs created both InterLex and full-text retrieval in Intermedia, many of these oppositions immediately appeared foolish, since anyone who clicked on a word and used Intermedia's electronic version of the *American Heritage Dictionary*—whether they were aware of it or not—inevitably used a second kind of linking. After all, activating a word and following a simple sequence of keys or using a menu brought one to another text (Figure 5). Of course, Web users now have near-immediate access to the
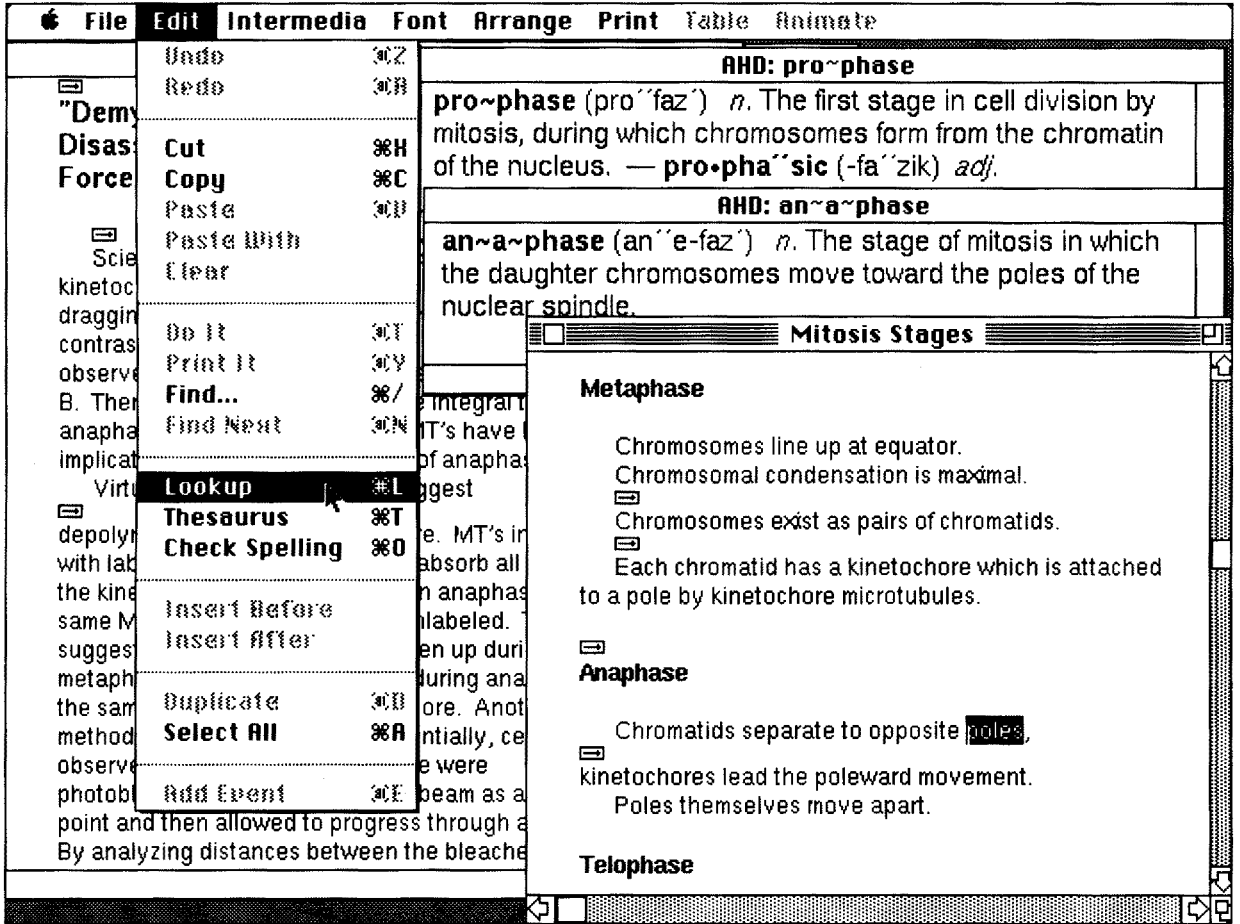
Figure 5. Hypertext Links and Information Retrieval: The InterLex Feature in Intermedia

fourth edition of *The American Heritage Dictionary* (www.bartleby.com) or to dictionaries in dozens of languages ranging from Abenaki and Armenian to Walloon and Yema on www.yourdictionary.com.

Microcosm, a system on which work began in the early days of Intermedia, has built this idea of reader-activated links into its environment in two ways. First, using the "Compute Links" function, readers activate what are essentially information-retrieval software tools to produce menus of links that take exactly the same form as menus of links created by authors. Soft links—links created on demand—appear to the reader identical to hard ones created by authors. Second, readers can activate implicit or generalized

links. When readers click on hard links, they activate a connection established by a hypertext author, who, in some systems, could be a previous hypertext reader. When readers activate "Compute Links," they use what are essentially information-retrieval devices to create a dynamic relation between one text and another. In contrast to both these previous approaches, Microcosm's generalized link function produces a different form of electronic connections that we call term *soft linking*, linking activated only on demand. Essentially, Microcosm's generalized links create a link that only appears when a reader asks for it (Figure 6). No link marker, no code, indicates its existence, and nothing deforms the text in a lexia to announce its presence. In fact, only a reader's interest—a reader's energy, active interest, or aggressive relation to the text—brings such a link fully into being. Readers will recognize that this approach, this kind of linking, permits the many-to-more-than-one linking that permitted me to have readers obtain an introductory discussion and two plates of a painting by a Victorian artist by clicking on the title of one of his paintings. Microcosm's generalized linking facility, in fact, permitted me to recreate in a matter of hours links that had taken weeks to create manually in another system.

The final forms of linking—action links, warm links (or reader-activated data-exchange links), and hot linking (automatic data-exchange links)—represent, in contrast, kinds that carry the hard, author-created link in other directions. These author-created links do more, in other words, than allow readers to traverse information space or bring the document to them. They either initiate an action or they permit one to do so.

In later chapters when we examine examples of hypermedia containing animation and video, we shall observe yet other permutations of the link. Nonetheless, these preliminary remarks permit us to grasp some of the complex issues involved with adding the link to writing, with reconfiguring textuality with an element that simultaneously blurs borders, bridges gaps, and yet draws attention to them.

Linking in Open Hypermedia

Systems: Vannevar Bush

Walks the Web

For more than a quarter century, many computer scientists have proposed a conception of linking that differs fundamentally from the one used by HTML, Storyspace, and earlier systems, such as Guide and HyperCard. This different way of conceiving the link, not surprisingly, is also associated with a different theory of how hypermedia systems should work. HTML and Storyspace have accustomed most of us to the idea that links exist as integral parts of documents in which they appear. To anyone who has

Finding of the Saviour in the Temple

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Ok

W. H. Hunt, The Finding of the Saviour (p

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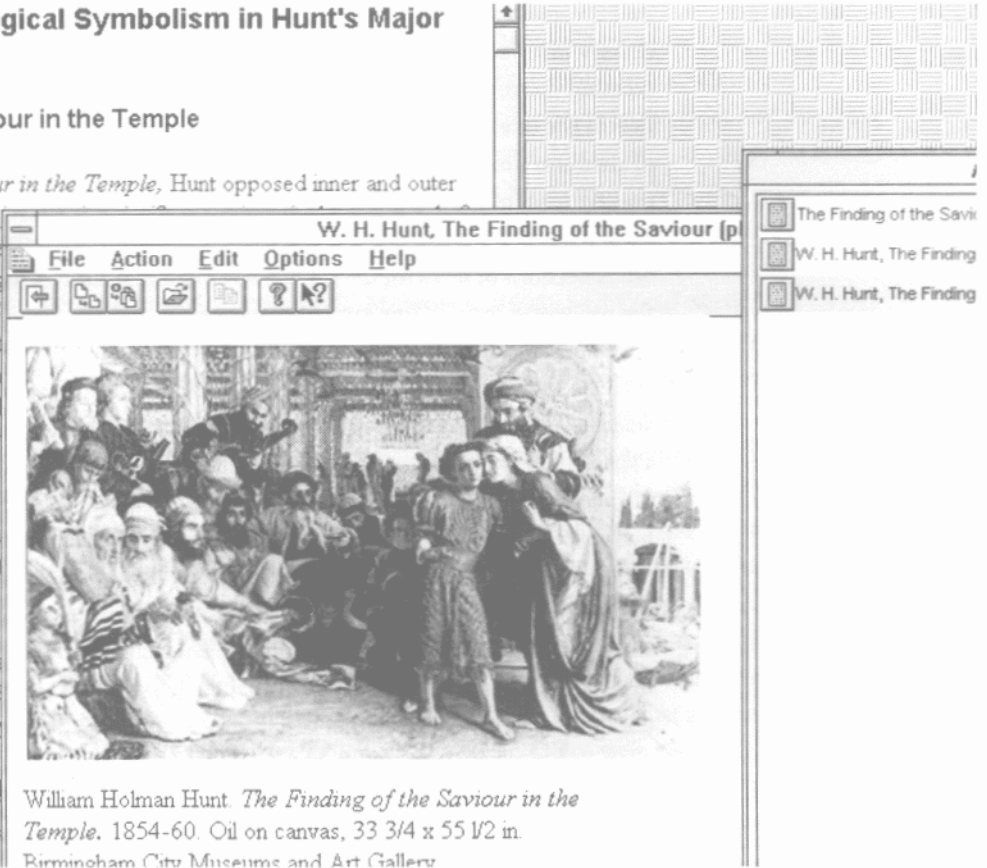
William Holman Hunt. *The Finding of the Saviour in the
Temple.* 1854-60. Oil on canvas, 33 3/4 x 55 1/2 in.
Birmingham City Museums and Art Gallery.

The Finding of the Savi
W. H. Hunt, The Finding
W. H. Hunt, The Finding

Figure 6. Generic Linking in Microcosm. This screen shot shows the results of following a generic link either from the word "Finding" or from the phrase "The Finding of the Saviour in the Temple" in the Microcosm version of my book *William Holman Hunt and Typological Symbolism.* This action produces a menu (*at right*) with three choices: a section of my original book containing the principal discussion of this painting and two discussions of it. Since choosing "Follow Link" (or double clicking) on any word or phrase that serves as an anchor produces these three choices, this screen shot represents many-to-many linking. Furthermore, although readers experience the results of generic linking (here the menu with three destination lexias) just as if the author had manually linked each anchor to the discussion and two illustrations, in fact the links only come into existence when readers call for them. One can therefore consider this screen to exemplify soft many-to-many linking. Although Microcosm permits authors to create the usual manual form of one-to-one and one-to-many links, the generic link function takes a great deal of the work out of creating informational hypertext webs.

ever created a link in HTML that point seems obvious, and, in fact, placing links within each lexia has major benefits, including simplicity, ease of creating them, and permanence—they don't move or get lost. This conception of the link, however, represents a fundamental departure from the kind of medium proposed by Vannevar Bush. The user of the memex, we recall, created trails of associative links on top of already existing texts, saved those trails, and shared them with others. Different readers could create very different collections of links for the same texts. Links, in other words, exist outside the individual lexia in this kind of hypermedia.

Many hypertext researchers, inspired by Bush, have designed and implemented such open hypermedia systems and infrastructures, a defining characteristic of which is the link database or linkbase (see Rizk and Sutcliffe for a list of such systems). Intermedia, one such system, drew upon its separation of links and data to permit users to generate multiple webs from the same body of texts and images; depending on an individual user's access rights, he or she could view the webs created by others. In educational terms, using a linkbase had the effect of permitting students to use the main course web plus links added by students or to screen out links created by them. It also permitted instructors, as we shall see in chapter 4, to use links to incorporate materials created by those in other disciplines within their webs without affecting either the original author's text or web. In practice, readers experienced an Intermedia web, such as *Context32,* much as they do its HTML descendant, *The Victorian Web.* In fact, each hypermedia collection of documents existed only as a virtual web called into being by the linkbase and linkserver.

The linkbase and its associated server, which combine to create link services, lie at the heart of open hypermedia systems like Hyperbase, Multicard, Sun's Link Service, Microcosm, and its various later incarnations. David C. De Roure, Nigel G. Walker, and Leslie A. Carr offer the following definition of these key terms:

At its simplest, a hypermedia link server takes a source anchor in a multimedia document and returns the possible destination anchors, obtained by interrogating a link database (henceforth a *linkbase*) for links containing that anchor. The anchors might identify specific locations or objects in particular multimedia documents; alternatively they might have broader applicability, matching content rather than position (so-called *generic* linking). The linkbase query might also be refined by the user's context, perhaps based on their profile, current role, task and location. Link services may be accessed before, during or after document delivery, and they may provide an interface for link creation and maintenance as well as retrieval. (67)

The Multimedia Research Group at the University of Southhampton under the leadership of Wendy Hall and Hugh Davis stands out as the team of computer scientists that has the longest continuous experience with open hypermedia. Their articles dominate the literature in the field, and they have produced a number of commercial systems. Microcosm, at which we looked earlier, appeared in commercial form as Multicosm (1994), and as the World Wide Web became increasingly prominent, the Southampton team applied the heart of Microcosm—its link services—to the Internet, creating Distributed Link Services (1995), Multicosm (1998), and Portal Maximizer (2001). Multicosm, the company formed to provide commercial versions of the group's link-services-based applications, has recently become Active Navigation, but the open hypermedia approach remains the same.

As Hays Goodman points out about Active Navigation, "the core technology behind the company's products is the ability to insert active hyperlinks on-the-fly in almost any textual format document." The already-observed forms of linking possible with Microcosm show what an immensely powerful system it is, but that power came at considerable cost—or, rather, at two different kinds of costs. Like all open systems, Microcosm and all its descendants require a separate server for the linkbase, and the team also had to create the software to make it work. A different kind of cost appears in the way Microcosm has created anchors. At first, Microcosm recorded links solely in terms of the anchor's position—essentially counting off numbers of characters or units of spatial measurement to record where in the document a phrase (or image) begins and ends. This method proved to have enormous advantages. Initially, the Southampton team had the goal of creating the kind of hypermedia system that Vannevar Bush would love, since it could create links not just in other people's documents but also in other software: one could, for example, link a document in MS Word to another in Word Perfect to another in a PDF file. This version of Microcosm worked, and much research went into devising ways of linking among different kinds of applications; one of the most interesting of these projects involved placing links inside a very large CadCam document used by architects, and part of the difficulty included creating tiny, yet accurate, summaries of the visual data. Eventually the team discovered that some features they wished to add to the system could function only if all text had the same format, and so they turned to a more closed system. In the Microcosm version of my book on Pre-Raphaelite painting, all the text documents were created in Word and saved as in the RTF (rich text format) file format, and although the system, like cur-

rent HTML, permits linking to images, in practice the need to attach captions to them resulted in placing images within text documents.

This wonderfully powerful system, which was convenient for both author and reader, permitted linking all kinds of data, but it had one Achilles heel: the computer files to which the system added links could not be modified in any way. Unlike Intermedia's linkbase, Microcosm's required freezing a document once it had links; adding or deleting words would move the link to an irrelevant phrase.

To solve this problem, one had to add a second method of identifying link anchors in the linkbase, one that required "matching content rather than position" (De Roure, Walker, and Carr, 67). This method has the great advantage of enabling powerful generic linking, but it is also much less suited to non-alphanumeric media. This seems to be the form of linkbase storage that allowed Microcosm-Multicosm to become a Web application. Goodman explains how one version marketed by Active Navigation works:

Portal Maximizer is implemented essentially as a Web proxy server. When the user requests a Web page, the browser will be directed to the Webcosm proxy. *Webcosm will fetch the page from the original location and annotate the page with extra links before passing the modified Web page back to the user's browser.* When the webmaster has activated this feature, the user will see portions of the text transformed into hyperlinks, which are derived from what is known as a linkbase. This linkbase contains at a minimum a source word or phrase, a destination URL [Uniform Resource Locator] and a description of the link. The linkbase is generated automatically by crawling the Web site at predetermined intervals, with the results fully tunable so that by moving a slider one can decide how broad or narrow particular themes can be. By making the themes broader, nearly every word in a document could theoretically be hyperlinked, but by selectively tuning that variable, more relevant results are obtained. Multiple linkbases can be used, so that different groups of users could see different results, depending on their profile or interests. (Emphasis added)

By storing links apart from text, images, and other media forms, open hypermedia systems can place links in someone else's Web document without ever affecting that document. Vannevar Bush walks the Web. Depending on the desires of those who own the server, these added links can be viewed by anyone who visits their website, or they can be screened from outsiders. The capacity of open hypermedia applications like Portal Maximizer to add links to documents coming from another site has important implications for our conceptions of authorship, intellectual property, and political rights, particularly the right of free speech.

As we have observed in the discussion of the hypermedia pioneers Bush and Nelson, they believed that one of the greatest strengths of hypertext lies in its capacity to permit users to discover or produce multiple conceptual structures in the same body of information. A respected group of computer scientists, however, reject Nelsonian style link-and-lexia hypertext represented by Intermedia, Microcosm, and the World Wide Web. In "As We Should Have Thought"—the title an obvious play on Bush's seminal essay—Peter J. Nürnberg, John J. Leggett, and Erich R. Schneider assert, for example, that "linking is more than harmful—it is downright deadly" (96). For anyone whose chief experience of hypermedia has involved reading computer help files and materials on the World Wide Web, these statements seem to come from authors dwelling in some *Through the Looking Glass* alternate universe—particularly when they explain that the "two main problems . . . with hypermedia research today" derive from "our current notion of linking. Firstly, linking implies a certain kind of structural paradigm, one in which the user (or occasionally a program) links information together for purposes of navigation . . . Secondly, linking implies the primacy of data, not structure" (96). They certainly describe what is commonly understood to be hypertext, and their reason for rejecting it becomes clear when they explain their emphasis on structure:

We should have realized that hypermedia is just a special case of a general philosophy of computing in which structure is more important than data. Structure should be the ubiquitous, atomic building block available to all systems at all times and from which all other abstractions (including data) are derived. Here we call this philosophy of the primacy of structure "structural computing." (96)

Clearly, Nürnberg, Leggett, and Schneider have an entirely different set of concerns than do Bush and Nelson.

In fact, they represent a different approach to information technology—spatial hypertext—which they point out "has always pushed the limits of our notions of hypertext . . . Structure in spatial hypertext systems is dynamic and implicit. It is defined by the placement of data objects in a space. This structure is not traversed explicitly for the purpose of navigating the information. Instead, it is traversed (by the system) for the purpose of finding higher-level compositions of atomic data objects and lower-level compositions" (97). They are concerned primarily with information systems that analyze structure computationally, and, despite their opening salvo, it turns out that they do not in fact reject link-and-lexia or navigational hypermedia at all

but simply wish to place their fundamentally different approach to computing "on a par with navigation systems" (97).

Nürnberg, Leggett, and Schneider point to VIKI, a system developed by Catherine C. Marshall and Frank M. Shipman III, as an example of spatial hypertext. As Marshall and Shipman explain, VIKI, which functions as a conceptual organizer, "provides users with visual and spatial affordances for organizing and interpreting information" ("Information Triage," 125). "Spatial hypertext," they explain elsewhere, "has its origins in browser-based approaches in which the emerging hypertext network is portrayed graphically, in an overview ... In browser-based hypertext, boxes generally symbolize nodes; lines represent the links among them. In a completely spatial view of hypertext, the lines—links—may be removed from the picture, and the nodes may move about freely against their spatial backdrop" ("Spatial Hypertext," online version). Systems like VIKI rely on our "spatial intelligence," using graphic interfaces to organize complex ideas. Boxlike icons, which may contain text, represent concepts, and users can arrange these boxes and nest one inside another to explore or express their relationship. The Storyspace view, which functions in this manner, exemplifies one feature of spatial hypertext, but to this VIKI adds "structure finding algorithms that analyze the spatial layout and the visually salient properties of the information objects," so that authors do not have to construct explicit structures themselves. Many discussions of spatial hypertext so emphasize conceptual structures that they make it seem purely an organizational tool, but Marshall and Shipman believe that both readers and writers can benefit from it: "For readers, the system provides an opportunity to read in context, with awareness of the related, nearby nodes." For writers, it supports exploring various conceptual structures. For both, the graphic display of manipulatable information hierarchies "helps keep complexity tractable" ("Spatial Hypertext," online version).

Nürnberg, Leggett, and Schneider's definition of the concept makes me suspect that what they term *spatial hypertext* has little to do with hypertext and hypermedia, though it certainly represents an important area of research in computer science. In contrast, Marshall and Shipman's description of a graphic overview in which one can hide the lines representing links (which one can do in Storyspace) suggests that such spatial display of information does play a role in specific hypertext systems, though I don't know if *by itself* that feature constitutes a form of hypermedia. Graphic sitemaps, such as *The Victorian Web*'s opening screen, the Storyspace view, and Eastgate Systems's Tinderbox all exemplify graphic presentation of conceptual structures, but they don't have VIKI's ability to analyze and represent such structures com-

putationally. Since the computer science literature uses the term *spatial hypertext*, I shall, too: in later chapters it refers to those aspects of hypertext environments, such as Storyspace, that use the graphic arrangement of lexias to convey structural information.

The Place of Hypertext in the History of Information Technology

The appearance of any new information technology like hypertext provides conditions for major societal change, though any change, such as the democratizing effects of writing, which took millennia, can take a very long time to occur. Such changes of information regimes always produce both loss and gain. In fact, let's propose a fundamental law of media change: no free lunch; or, there is no gain without some loss. Thus, if writing offers us the ability to contemplate information and respond to it at our leisure, thereby permitting personal reflection and considered thought, it also lacks the immediacy of the spoken voice and the clues that we receive while observing the person to whom we are speaking. Similarly, if we gain large audiences, new forms of text preservation, and standardization of the vernacular from print, we also lose what Benjamin termed the "aura" provided by the unique object. When people find that any particular gain from a new information technology makes up for the corollary loss, they claim it represents progress; when they feel loss more than gain, they experience the new information technology as cultural decline. Printing, an information technology that has so shaped our culture that most see it as an unqualified benefit, had its bad effects, too. Late medieval and early Renaissance connoisseurs, who mourned the loss of the scribal hand and pages that integrated words and images, considered printing a crude technology that destroyed aesthetic quality and blamed it for removing an important source of beauty from the world. For this reason they paid scribes to copy printed books and create manuscripts.[10] Far more important, the printed book, as Elizabeth Eisenstein has shown, led directly to centuries of religious warfare. Historians of the printed book point out the way it has shaped our culture, influencing our notions of self, intellectual property, language, education, and scholarship, and they present it in a largely favorable light but admit it had other effects as well. So when we consider the potential of hypermedia to change the way we do things, we must ask what the gains are and how they balance the losses that any new information regime causes.

Evaluating the relative effects and values of various media in relation to one another always turns out, however, to be more than a simple matter of

loss and gain, because as J. David Bolter and Richard Grushin convincingly argue, every new medium

appropriates the techniques, forms, and social significance of other media and attempts to rival or refashion them in the name of the real. A medium in our culture can never operate in isolation, because it must enter into relationships of respect and rivalry with other media. There may be or may have been cultures in which a single form of representation (perhaps painting or song) exists with little or no reference to other media. Such isolation does not seem possible for us today, when we cannot even recognize the representational power of a medium except with reference to other media. (65)[11]

For an instantly convincing example of the ways in which newer and older information technologies influence each other, we need go no farther than Bolter and Grushin's observation that CNN and other television networks have increasingly resembled webpages, and at the same time the CNN "web site borrows its sense of immediacy from the televised CNN broadcasts" (9). Some examples of remediation produce results that can strike us as very odd indeed. Take the case of the arrival of printing within a scribal culture. "Typography was no more an addition to the scribal art than the motorcar was an addition to the horse. Printing had its 'horse-less carriage' phase of being misconceived and misapplied during its first decades, when it was not uncommon for a purchaser of a printed book to take it to a scribe to have it copied and illustrated" (McLuhan, *Understanding Media*, 189).

Before examining the relation of hypertext to previous media, I propose to look briefly at the advantages and disadvantages of various forms of information technology, a term that today is often mistakenly understood to refer solely to computing. Digital information technology certainly begins with the electronic digital computer, but information technology itself has been around for millennia. It begins with spoken language, which makes possible communal or community memory that in turn permits cultural development. Unlike biological or Darwinian development, such cultural (or Lamarkian) change permits groups of people to accumulate knowledge and practice and then pass them on to later generations; writing serves as individual prosthetic memory, which in turn creates a prosthetic group or community memory.

Speech as an information technology has certain qualities, which can be experienced as advantageous or disadvantageous, depending on the specific situations in which it occurs. "Language, like currency," McLuhan reminds us in *Understanding Media*, "acts as a store of perception and as a transmitter of the perceptions and experience of one person or one generation to an-

other. As both a translator and storehouse of experience, language is, in addition, a reducer and a distorter of experience. The very great advantage of accelerating the learning process, and of making possible the transmission of knowledge and insight across time and space, easily overrides the disadvantages of linguistic codifications of experience" (151–52). These are not the only advantages and disadvantages of spoken language, for as Derrida (following Plato) urges, it is fundamentally a technology of *presence.* Speaker and listener have to be present in the same place and time, though, as Christian Metz points out, both do not have to be in sight of each other; one can, for example, hear words spoken by someone on the other side of a door or in a darkened room. What advantages and what disadvantages, then, does such an information technology based on presence have? This question turns out to be an especially crucial one, because many info-pundits automatically assume that presence has more importance than all other qualities and effects of any particular information technology. I've often observed that many writers on media, particularly its educational applications, often react to improvements in computing, such as increased speed of Internet connections, as if the most important result of any such change lies in the possibility of affordable telepresence. They imply that speaking in sight of the listener always has more value than writing or other forms of communication. In other words, considering the possibility of sending and receiving large quantities of information over electronic networks, the first reaction of many educators and businesspersons is that we can replace written text by talking heads.

This typical reaction exemplifies Bolter and Grushin's point that the advocates of all new information technologies always claim theirs possess *immediacy,* and this claim derives from "the desire to get past the limits of representation and to achieve the real" (53). Such assumptions, which ignore the very different strengths of speech and writing, demonstrate that many people believe that being in the presence of someone trumps all the advantages, including reflection, abstraction, organization, and concision, that writing enables. Moreover, presence is itself not always a desirable, much less the most important, quality when communicating with another person. We can all think of situations in which we feel more comfortable talking on a telephone than speaking to someone face to face: when we do not look our best—say, because we've just awakened—or when we wish to fend off someone trying to solicit money for a charity or sell us something. Absence, in other words, also has great value in certain communicative situations, a crucial factor to take into account when considering the gains and losses involved in writing.

Writing, probably the most important technology human beings ever developed, exchanges presence and simultaneity for asynchronous communication—for the opportunity to respond at one's own convenience. Because it does not base the act of communication on presence, writing does not require the person communicating to be in either the same place or the same time as the person receiving the communication. The person communicating information places it in a form that permits someone else to receive it later. Writing, printing, cinema, and video are all forms of asynchronous communication, which, as McLuhan points out in *The Gutenberg Galaxy*, permits reflection, abstraction, and forms of thought impossible in an oral culture. Writing's combination of absence and asynchronisity obviously permits a new kind of education, as well as itself becoming a goal of education, since teaching reading and writing becomes a primary function of early instruction in eras in which these skills are important.

For millennia, writing, which eventually leads to silent reading, nonetheless remained a technology that oddly combined orality and literacy. The explanation for this situation lies in economic and material factors. The high cost and scarcity of writing surfaces prompted scribes to omit spaces between words and adopt a bewildering array of abbreviations, all so they could cram as many characters as possible on a scroll or page. These material conditions produced a kind of text that proved so difficult to read that it chiefly served as a mnemonic device, and readers often read aloud. Eventually, around the year 1000, cheaper writing materials led to the development of interword spacing, which in turn encouraged silent reading—a practice that tended to exchange expressive performance and a communal experience for privacy, increasing reading speed, and the sense of personal or inner place. Interword spacing, like the codex (what we generally call a book), eventually changed reading from a craft skill to an ordinary one required of every citizen.

Since the invention of writing and printing, information technology has concentrated on the problem of creating and then disseminating static, unchanging records of language. As countless authors since the inception of writing have proclaimed, such fixed records conquer time and space, however temporarily, for they permit one person to share data with other people in other times and places. As Elizabeth Eisenstein argues, printing adds the absolutely crucial element of multiple copies of the same text; this multiplicity, which preserves a text by dispersing individual copies of it, permits readers separated in time and space to refer to the same information (116). As Eisenstein, Marshall McLuhan, William M. Ivins, J. David Bolter, and other

students of the history of the cultural effects of print technology have shown, Gutenberg's invention produced what we today understand as scholarship and criticism in the humanities. No longer primarily occupied by the task of preserving information in the form of fragile manuscripts that degraded with frequent use, scholars, working with books, developed new conceptions of scholarship, originality, and authorial property.

Hand-set printing with movable type permits large numbers of readers widely separated in time and space to encounter essentially the same text—and hence creates a new kind of virtual community of readers and many other things basic to modern culture. The existence of multiple copies of the same text permits readers hundreds of miles and hundreds of years apart to refer to specific passages by page number. Printing, which thus exemplifies asynchronous, silent communication, provides the conditions for the development of a humanistic and scientific culture dependent on the ability to cite and discuss specific details of individual texts. And of course it drastically changes the nature of education, which moves from dictating primary texts to the student to teaching the student modes of critical analysis. "Even in the early eighteenth century," McLuhan reminds us, "a 'textbook' was still defined as a 'Classick Author written very wide by Students, to give room for an Interpretation dictated by the Master, &c., to be inserted in the Interlines' (O.E.D.). Before printing, much of the time in school and college classrooms was spent in making such texts" (*Understanding Media*, 189).

High-speed printing, which appeared in the nineteenth century, truly acted as a democratizing force, producing many of our conceptions of self, intellectual property, and education. In addition to creating a virtual community of readers, the relatively inexpensive texts created by high-speed printing radically changed the notions of an earlier manuscript culture about how to preserve texts: with printing, one preserves texts by creating and distributing multiple copies of them rather than, as with manuscripts, which eventually degrade after many readings, protecting the text by permitting fewer people to have access to it. As we all know, the book also functions as a kind of self-teaching machine that turns out to be far more accessible and hence more quickly democratizing than manuscript texts can ever be.

Although the fixed multiple text produced by print technology has had enormous effects on modern conceptions of literature, education, and research, it still, as Bush and Nelson emphasize, confronts the knowledge worker with the fundamental problem of an information retrieval system based on physical instantiations of text—namely, that preserving information in a fixed, unchangeable linear format makes information retrieval difficult.

We may state this problem in two ways. First, no one arrangement of information proves convenient for all who need that information. Second, although both linear and hierarchical arrangements provide information in some sort of order, that order does not always match the needs of individual users of that information. Over the centuries scribes, scholars, publishers, and other makers of books have invented a range of devices to increase the speed of what today are called information processing and retrieval. Manuscript culture gradually saw the invention of individual pages, chapters, paragraphing, and spaces between words. The technology of the book found enhancement by pagination, indices, and bibliographies. Such devices have made scholarship possible, if not always easy or convenient to carry out.

The next great change in information technology—and that which most concerns us—came with the development of digital information technology. For the first time, writing, which had always been a matter of physical marks on a physical surface, instead takes the form of electronic codes, and this shift from ink to electronic code—what Jean Baudrillard calls the shift from the "tactile" to the "digital" (*Simulations,* 115)—produces an information technology that combines fixity and flexibility, order and accessibility—but at a cost.[12] Using Diane Balestri's terminology, we can say that all previous media took the form of hard text (cited in Miles, "Softvideography"); computing produces soft text, and this fundamental change, like all developments in infotech, comes with gains and losses. For example, although electronic writing has the multiplicity of print, it does not have the fixity—and hence the reliability and stability—of either written or printed texts.

As Bolter and Grushin point out, over the past half century digital computing has undergone what they call a "process of 'remediatization'" during which society understood it as having fundamentally different purposes:

■ The "programmable digital computer was invented in the 1940s as a *calculating engine* (ENIAC, EDSAC, and so on)" (66) for military and scientific application.

■ During the next decade "large corporations and bureaucracies" (66) used it, instead, for *accounting.*

■ About the same time, a few pioneers saw the computer as "a new *writing technology*" (66).

■ Turing and those involved with AI (artificial intelligence) saw the computer primarily as a *"symbol manipulator"* that could "remediate earlier technologies of arbitrary symbol manipulation, such as handwriting and printing" (66).

■ "In the 1970s, the first *word processors* appeared, and in the 1980s the desktop computer. The computer could then become a medium because it could enter into the social and economic fabric of business culture and remediate the typewriter almost out of existence" (66).

■ More recently, the computer has been seen as an *image capturer, presenter, and manipulator:* "If even ten years ago we thought of computers exclusively as numerical engines and word processors, we now think of them also as devices for generating images, reworking photographs, holding videoconferences, and providing animation and special effects for film and television" (23).

This fundamental shift from tactile to digital, physical to code, and hard to soft media produces text with distinctive qualities. First of all, since electronic text processing is a matter of manipulating computer codes, all texts that the reader-writer encounters on the screen are virtual texts. Using an analogy to optics, computer scientists speak of "virtual machines" created by an operating system that provides individual users with the experience of working on their own individual machines when they in fact share a system with as many as several hundred others.[13] According to the *Oxford English Dictionary*, "virtual" is that which "is so in essence or *effect*, although not formally or actually; admitting of being called by the name so far as the effect or result is concerned," and this definition apparently derives from the use of the term in optics, where it refers to "the apparent focus or image resulting from the effect of reflection or refraction upon rays of light." In computing, the virtual refers to something that is *"not physically existing as such but made by software to appear to do so* from the point of view of the program or the user" (emphasis added). As Marie-Laure Ryan points out, the powerful concept of virtualization "leads from the here and now, the singular, the usable once-for-all, and the solidly embodied to the timeless, abstract, general, multiple, versatile, repeatable, ubiquitous, and morphologically fluid" (37).[14]

Similarly, all texts the reader and the writer encounter on a computer screen exist as a version created specifically for them while an electronic primary version resides in the computer's memory. One therefore works on an electronic copy until such time as both versions converge when the writer commands the computer to "save" one's version of the text by placing it in memory. At this point the text on screen and in the computer's memory briefly coincide, but the reader always encounters a virtual image of the stored text and not the original version itself; in fact, in descriptions of electronic word processing, such terms and such distinctions do not make much sense.

As Bolter explains, the most "unusual feature" of electronic writing is

that it is "not directly accessible to either the writer or to the reader. The bits of the text are simply not on a human scale. Electronic technology removes or abstracts the writer and reader from the text. If you hold a magnetic tape or optical disk up to the light, you will not see text at all . . . In the electronic medium several layers of sophisticated technology must intervene between the writer or reader and the coded text. There are so many levels of deferral that the reader or writer is hard put to identify the text at all: is it on the screen, in the transistor memory, or on the disk?" (*Writing Space*, 42–43). Furthermore, whereas a printed book has weight and mass, its digital form appears immaterial. "If you want to get picky about the physics," Mitchell elegantly explains, "we can say that the corpus of classical literature is now embodied electromagnetically, and, yes, electrons do have mass. But that is irrelevant at the level of everyday experience. My briefcase quickly gets weighed down if I load volumes of the Loeb Classical Library into it, but my laptop does not get any heavier if I download the *TLG* onto its hard drive" (*Me++*, 231n. 7).

The "'virtual' and the 'material,'" Ned Rossiter reminds us, "are always intimately and complexly intertwined" (177), and so emphasizing the virtuality of electronic *text and image* in no way implies that the actual reading experience involves either a disembodied reader or a nonmaterial presentation of text itself. As N. Katherine Hayles emphasizes, we have to find new ways "to think about embodiment in an age of virtuality" (193).[15] We must, for example, come to the absolutely necessary recognition that the physical, material conditions of computer devices we use affect our experience of virtual text. As I have pointed out elsewhere, the size of monitors, the change from bitmap to grayscale to color displays, the portability of computers, and our physical distance from them make dramatic differences in kinds of texts we can read and write ("What's a Critic to Do?" and "Connected Images," 82).[16] Computer text may be virtual, but we who read it are still physical, to read it we rely on physical devices, and it has effects on the physical world. "Bits just don't sit out there in cyberspace," Mitchell reminds us, and therefore "it makes more sense to recognize that invisible, intangible, electromagnetically encoded information establishes new types of relationships among *physical* events occurring in *physical* places" (*Me++*, 4).

The code-based existence of electronic text that makes it virtual also makes it infinitely variable. If one changes the code, one changes the text. As Hayles has pointed out, "When a text presents itself as a constantly refreshed image rather than as a durable inscription, transformations can occur that would be unthinkable if matter and energy, rather than informational patterns, formed the primary basis for the systemic exchanges" (30). Further-

more, since digital information technology stores both alphanumeric text (words) and images as codes, it sees no essential difference between them. With images, as with words, if one manipulates the code, one manipulates the text that this code preserves and produces. Furthermore, as anyone who has ever resized a web browser window or enlarged a font in a Microsoft Word or PDF file knows, this text-as-code is always adaptable. Because users only experience a virtual image of the text, they can manipulate the version they see without affecting the source. Many forms of computer text, in other words, grant the reader more power than does any example of writing or print, though occasionally at the cost of a loss of powerful graphic design. E-text documents also have permeable limits: borders and edges, like spaces, are matters of physicality, materiality, embodiment, but digital text—text woven of codes— does not have and cannot have such unity, such closure. The digital text, which exists independent of the place in which we experience it, e-merges as dispersed text. When we discuss hypertext later, we shall see that hypertextual linking relates in important ways to this property of electronic text.

The coded basis of digital text permits it to be processed in various ways, producing documents, for example, that are both searchable and analyzable. Thus users can search electronic texts for letters and other characters, words, or various groups of them. Users can also take advantage of such code-based textuality to check the spelling, grammar, and style of digital text. Processable text also permits text as simulation since changing the code makes the text move to show things impossible to present with a static image or text. As we shall see when we examine examples of animation in chapter 3, such capacities permit one to argue by demonstrating things often too difficult to show easily with linguistic argument.

Digital text can be infinitely duplicated at almost no cost or expenditure of energy. Duplicate the code, duplicate the text—a fact true for images (including images of text, as above) or alphabetic text. As Mitchell explains with characteristic clarity, "Digital texts, images, and other artifacts begin to behave differently from their heavier, materially embedded predecessors. They become nontrivial assets—they are neither depleted not divided when shared, they can be reproduced indefinitely without cost or loss of quality, and they can be given away without loss to the giver" (*Me++*, 83). One can just duplicate the code and thereby repeat—reproduce—the text, thereby affecting the cost (and value) of the text and the potential size of one's audience.

Because the codes that constitute electronic text can move at enormous speed over networks, either locally within organizations or on the Internet, they create the conditions for new forms of scholarly and other communica-

tion. Before networked computing, scholarly communication relied chiefly on moving physical marks on a surface from one place to another with whatever cost in time and money such movement required. Networked electronic communication so drastically reduces the time scale of moving textual information that it produces new forms of textuality. Just as transforming print text to electronic coding radically changed the temporal scale involved in manipulating texts, so too has it changed the temporal scale of sharing them. Networked electronic communication has both dramatically speeded up scholarly communication and created quickly accessible versions of older forms of it, such as online, peer-reviewed scholarly journals, and new forms of it, such as discussion lists, chat groups, blogs, and IRC (Internet Relay Chat) (Landow, "Electronic Conferences," 350). In networked environments users also experience electronic text as location independent, since wherever the computer storing the text may reside in physical reality, users experience it as *being here,* on their machines. When one moves the text-as-code, it moves fast enough that it doesn't matter where it "is" because it can be everywhere . . . and nowhere.[17] Finally, electronic text is *net-work-able,* always capable of being joined in electronic networks. Thus, hypertext and the World Wide Web.

Like many features of digital textuality, the sheer speed of obtaining information has its good and bad sides. Its advantages include increasingly sophisticated World Wide Web search tools, such as Google, that can provide needed information nearly instantaneously. For example, as part of the process of writing *Hypertext 3.0,* I wanted to look up some technical terms (RSS, Atom feed) related to blogs. Typing one of these terms into Google, I pressed the "return" key and received a list of relevant web documents in less than a second—0.22 second, to be exact; the information I found most useful occurred in the first and third listed items. The convenience of such information retrieval has increasingly led students and faculty to use such search tools instead of physical libraries. Indeed, "'one of the rarest things to find is a member of the faculty in the library stacks,'"—so Katie Hafner's article in the *New York Times* quotes an instructor at a major research university.

True, Hafner slightly sensationalizes the use of Google in research by not clarifying the difference between Internet searches and online resources, such as large collections of scholarly journals that originally appeared in print. Faculty and students devote a good deal of their research time to locating and reading these scholarly journals, so online versions of them are enormously convenient: one can locate individual articles in a few minutes at most, multiple users can read them at the same time, and one can obtain them when the library is closed; some journals are actually more to pleasant

to read online, since one can increase the size of print in the online copy. Nonetheless, not all research involves back issues of specialist periodicals, and depending on Internet search tools at the present time might cause one to miss a good deal:

> The biggest problem is that search engines like Google skim only the thinnest layers of information that has been digitized. Most have no access to the so-called deep Web, where information is contained in isolated databases like online library catalogs. Search engines seek so-called static Web pages, which generally do not have search functions of their own. Information on the deep Web, on the other hand, comes to the surface only as the result of a database query from within a particular site. Use Google, for instance, to research Upton Sinclair's 1934 campaign for governor of California, and you will miss an entire collection of pamphlets accessible only from the University of California at Los Angeles's archive of digitized campaign literature.

With an estimated 500 billion webpages hidden from search engines, companies like Google and Yahoo have entered into agreements with major libraries to index their collections. Still, as many observers have pointed out, researchers who only Google for their information—yes, it's actually become a much-used verb—miss not only a good deal of valuable material but the pleasures of working with printed books and materials, including the delightful serendipity of stumbling onto something particularly interesting while looking for something else. If history provides any lessons, then the marked convenience of Internet resources will increasingly dominate both scholarly research and far more common everyday searches for information: the appearance of the printed book did not make individual manuscripts any more difficult to use than they had been before Gutenberg, but eventually the rapidly growing number of texts in print, their standardized vernacular, and their increased legibility made them so convenient that only scholars with very specific interests consulted manuscripts, or still do.

Frankly, I think the consequences for literary education, criticism, and scholarship are vastly exaggerated for two simple reasons. First, comparatively little—indeed, almost no—*literary* research requiring this kind of inaccessible information takes place in colleges and universities. Much of what is now termed *literary research* simply takes the form of reading secondary materials, and the rest involves working with materials contemporary with the texts one is studying—materials almost always catalogued. As far as undergraduate education is concerned, I believe electronic resources like JSTOR provide a far greater range of information than do *Twentieth-Century Views* and other prepackaged collections of secondary materials.

Far more important, libraries frequently do not have that kind of information missed by Internet search tool in handwritten, typed, or printed form because many of these materials are out of fashion and hence fall beneath the radar. As an old-fashioned hide-bound scholar whose first books depended on manuscripts and extremely rare printed material, I quickly discovered that my own university library and others had neither the information I needed nor the information about the information. For example, looking for the published transcripts of sermons John Ruskin commented on in his diary while in the midst of an agonizing religious crisis, I discovered that major New York libraries had no record of what was once an extremely popular and profitable genre (at least three weekly British periodicals dispatched stenographers to take down the sermons of popular preachers; I stumbled onto the fact of their existence when Ruskin quoted from one in a famous letter to *The Times;* the great Victorian scholar Geoffrey Tillotson, then my Fulbright advisor, told me: "I think you're on to something important. Follow it up."). I finally found uncatalogued copies stored in a carton in the basement of a theological seminary. Another example: the catalogue of the Beineke rare book library at Yale—"accessed" by snailmail and the good offices of a librarian—listed the manuscript of one of Ruskin's own childhood notes on sermons (his mother made him do it), but I unexpectedly discovered the valuable first draft of these notes in a display case in the tiny museum in Coniston, where Ruskin lived for many years. Even if one knows where materials are located through the scholarly grapevine, they may not be maintained in easily searchable form. After traveling to the Isle of Wight to work with the vast collection of Ruskin letters and diaries at the Bembridge School, I discovered they were uncatalogued. Even locating the catalogue entry for an item (the information about the information) doesn't mean you will find it. Thus, when I thought I had located in the then-British Museum Library a crucial anonymous exhibition pamphlet in fact written by the artist W. Holman Hunt himself, I submitted my call-slip, waited forty-five minutes, and discovered that it had been "destroyed by enemy action" during the Blitz; I unexpectedly bumbled onto a copy at the bottom of a trunk when, as I was leaving his adopted granddaughter's home, she asked, "Would you like to look through some things in the garage?" That's enough of what van Dam called van "barefoot-in-the-snow stories" (889) in his keynote address at the world's first hypertext conference. Two points: first, it's obviously better to be lucky than good, and, second, digitizing all the library catalogues and deep Web material in the world does not help if the information you need is not there in the first place—and for much of the most interesting kind of research that cataloguing information does not exist.

Far more important a problem with digital searches, as Eugene Provenzo warned two decades ago, is not what necessary information we can't find but what personal information governments and corporations can near-instantly discover about us. One example will suffice. Google, which has so shaped the world of education and scholarship, is currently offering free e-mail accounts with enormous storage (1 gigabyte), and the company urges users never to discard anything: "You never know when you might need a message again, but with traditional webmail services, you delete it and it's gone forever. With Gmail, you can easily archive your messages instead, so they'll still be accessible when you need them." According to a website whose URL is gmail-is-too-creepy.com, "Google admits that even deleted messages will remain on their system, and may also be accessible internally at Google, for an indefinite period of time." The danger, according to Public Information Research, which created the site, is that the company pools its information, keeps it indefinitely, and can share it with anyone they wish. "All that's required is for Google to 'have a good faith belief that access, preservation or disclosure of such information is reasonably necessary to protect the rights, property or safety of Google, its users or the public." These privacy advocates claim that the company's statements about terms of use and privacy "mean that all Gmail account holders have consented to allow Google to show any and all email in their Gmail accounts to any official from any government whatsoever, even when the request is informal or extralegal, at Google's sole discretion." Moreover, nothing in Gmail's stated policy clarifies if it will save and index incoming mail from those who have not agreed to use their system. When one uses Google as a search tool, its software, like that of many other sites, places a so-called cookie with a unique ID number on your computer that does not expire until 2038. By that means it keeps track of any search you have ever made. According to various privacy advocates and consumer groups, connecting e-mail to this powerful tool creates the inevitability of enormous abuses by corporate and government interests, many of whom are not subject to U.S. law—this last a particularly relevant point since two-thirds of Google users live outside the United States, many in countries without privacy laws. No free lunch.

Interactive or Ergodic?

Readers may have noticed that in the preceding discussions of electronic media I have not employed the words *interactive* and *interactivity*. As many commentators during the past decade and a half have observed, these words have been used so often and so badly that they have little exact meaning anymore. Just as chlorophyll was

used to sell toothpaste in the 1950s and aloe was used to sell hand lotion and other cosmetic products in the 1970s and 1980s, *interactive* has been used to sell anything to do with computing, and the word certainly played a supporting role in all the hype that led to the dotcom bust. The first time I heard the two terms criticized, I believe, was in 1988, when a speaker at a conference, who was satirizing false claims that computers always give users choices, projected a slide of a supposed dialogue box. To the question, "Do you want me to erase all your data?" the computer offered two choices: "Yes" and "OK."[18]

Espen Aarseth, who has particular scorn for *interactive* and *interactivity,* quite rightly points out that "to declare a system is interactive is to endorse it with a magic power" (48). He proposes to replace it by *ergotic,* "using a term appropriated from physics that derives from the Greek words *ergon* and *hodos,* meaning 'work' and 'path.' In ergodic literature, nontrivial effort is required to allow the reader to traverse the text. If ergodic literature is to make sense as a concept, there must also be nonergodic literature, where the effort to traverse the text is trivial, with no extranoematic responsibilities placed on the reader except (for example) eye movement and the periodic or arbitrary turning of pages" (1–2). *Ergodic,* which has the particular value of being new and thus far not used in false advertising, has received wide acceptance, particularly by those who study computer games as cultural forms. Still, Marie-Laure Ryan's *Narrative as Virtual Reality* (2001), one of the most important recent books on digital culture, retains "interactive," and a glance through the proceedings of 2003 Melbourne Digital Arts Conference reveals that people working with film and video also prefer the term.[19]

Ergodic, when used as a technical term, has its problems, too, since it's not clear that the reader's "eye movement" and turning pages, which result from intellectual effort, are in fact trivial—a point Aarseth himself seems to accept when he emphasizes Barthes's point that readers can skip about a page (78). *Ergodic* nonetheless appears a useful coinage, and so is the word *interactive* when used, as in Ted Nelson's writings, to indicate that the computer user has power to intervene in processes while they take place, as opposed to the power to act in a way that simply produces an effect, such as flipping a switch to turn on a light. The wide misuse of an important term is hardly uncommon. After all, *deconstruction* has been used in academic writing and newspapers to mean everything from "ordinary interpretation" to "demolition" while the term *classical* has meant everything from a "historical period," to an "aesthetic style," to an "eternal principle found throughout human culture." Before writing these paragraphs I checked the earlier version of *Hypertext* and found only four uses of *interactive* other than in quoted material; this one

uses six. Even though I do not employ it very much, I think *interactive,* like *ergodic,* has its uses.

Baudrillard, Binarity, and the Digital

Jean Baudrillard, who presents himself as a follower of Walter Benjamin and Marshall McLuhan, is someone who seems both fascinated and appalled by what he sees as the all-pervading effects of digital encoding, though his examples suggest that he is often confused about which media actually employ it.[20] The strengths and weaknesses of Baudrillard's approach appear in his remarks on the digitization of knowledge and information. Baudrillard correctly perceives that movement from the tactile to the digital is the primary fact about the new information technology, but then he misconceives—or rather only partially perceives—the implications of his point. According to him, digitality involves binary opposition: "Digitality is with us. It is that which haunts all the messages, all the signs of our societies. The most concrete form you see it in is that of the test, of the question/answer, of the stimulus/response" (*Simulations,* 115). Baudrillard most clearly posits this equivalence, which he mistakenly takes to be axiomatic, in his statement that "the true generating formula, that which englobes all the others, and which is somehow the stabilized form of the code, is that of binarity, of digitality" (145). From this he concludes that the primary fact about digitality is its connection to "cybernetic control . . . the new operational configuration," since "digitalization is its metaphysical principle (the God of Leibnitz), and DNA its prophet" (103).[21]

True, at the most basic level of machine code and at the far higher one of program languages, digitalization, which constitutes a fundamental of electronic computing, does involve binarity. But from this fact one cannot so naively extrapolate, as Baudrillard does, a complete thought-world or *episteme.* Baudrillard, of course, may well have it partially right: he might have perceived one key connection between the stimulus/response model and digitality. The fact of hypertext, however, demonstrates quite clearly that digitality does not necessarily lock one into either a linear world or one of binary oppositions.

Unlike Derrida, who emphasizes the role of the book, writing, and writing technology, Baudrillard never considers verbal text, whose absence glaringly runs through his argument and reconstitutes it in ways that he obviously did not expect. Part of Baudrillard's theoretical difficulty, I suggest, derives from the fact that he bypasses digitized verbal text and moves with too easy grace directly from the fact of digital encoding of information in two directions: (1) to his stimulus/response, either/or model, and (2) to other nonalphanumeric (or nonwriting) media, such as photography, radio, and televi-

sion. Interestingly enough, when Baudrillard correctly emphasizes the role of digitality in the postmodern world, he generally derives his examples of digitalization from media that, particularly at the time he wrote, for the most part depended on analogue rather than digital technology—and the different qualities and implications of each are great. Whereas analogue recording of sound and visual information requires serial, linear processing, digital technology removes the need for sequence by permitting one to go directly to a particular bit of information. Thus, if one wishes to find a particular passage in a Bach sonata on a tape cassette, one must scan through the cassette sequentially, though modern tape decks permit one to speed the process by skipping from space to space between sections of music. In contrast, if one wishes to locate a passage in digitally recorded music, one can instantly travel to that passage, note it for future reference, and manipulate it in ways impossible with analogue technologies—for example, one can instantly replay passages without having to scroll back through them.

In concentrating on nonalphanumeric media, and in apparently confusing analogue and digital technology, Baudrillard misses the opportunity to encounter the fact that digitalization also has the potential to prevent, block, and bypass linearity and binarity, which it replaces with multiplicity, true reader activity and activation, and branching through networks. Baudrillard has described one major thread or constituent of contemporary reality that is potentially at war with the multilinear, hypertextual one.

In addition to hypertext, several aspects of humanities computing derive from virtuality of text. First of all, the ease of manipulating individual alphanumeric symbols produces simpler word processing. Simple word processing in turn makes vastly easier old-fashioned, traditional scholarly editing—the creation of reliable, supposedly authoritative texts from manuscripts or published books—at a time when the very notion of such single, unitary, univocal texts may be changing or disappearing.

Second, this same ease of cutting, copying, and otherwise manipulating texts permits different forms of scholarly composition, ones in which the researcher's notes and original data exist in experientially closer proximity to the scholarly text than ever before. According to Michael Heim, as electronic textuality frees writing from the constraints of paper-print technology, "vast amounts of information, including further texts, will be accessible immediately below the electronic surface of a piece of writing . . . By connecting a small computer to a phone, a professional will be able to read 'books' whose footnotes can be expanded into further 'books' which in turn open out onto

a vast sea of data bases systemizing all of human cognition" (*Electric Language*, 10–11). The manipulability of the scholarly text, which derives from the ability of computers to search databases with enormous speed, also permits full-text searches, printed and dynamic concordances, and other kinds of processing that allow scholars in the humanities to ask new kinds of questions. Moreover, as one writes, "the text in progress becomes interconnected and linked with the entire world of information" (*Electric Language*, 161).

Third, the electronic virtual text, whose appearance and form readers can customize as they see fit, also has the potential to add an entirely new element—the electronic or virtual link that reconfigures text as we who have grown up with books have experienced it. Electronic linking creates hypertext, a form of textuality composed of blocks and links that permits multilinear reading paths. As Heim has argued, electronic word processing inevitably produces linkages, and these linkages move text, readers, and writers into a new writing space:

The distinctive features of formulating thought in the psychic framework of word processing combine with the automation of information handling and produce an unprecedented linkage of text. By *linkage* I mean not some loose physical connection like discrete books sharing a common physical space in the library. Text derives originally from the Latin word for weaving and for interwoven material, and it has come to have extraordinary accuracy of meaning in the case of word processing. Linkage in the electronic element is interactive, that is, texts can be brought instantly into the same psychic framework. (*Electric Language*, 160–61)

The presence of multiple reading paths, which shift the balance between reader and writer, thereby creating Barthes's writerly text, also creates a text that exists far less independently of commentary, analogues, and traditions than does printed text. This kind of democratization not only reduces the hierarchical separation between the so-called main text and the annotation, which now exist as independent texts, reading units, or lexias, but it also blurs the boundaries of individual texts. In so doing, electronic linking reconfigures our experience of both author and authorial property, and this reconception of these ideas promises to affect our conceptions of both the authors (and authority) of texts we study and of ourselves as authors.

Equally important, all these changes take place in an electronic environment, the Nelsonian docuverse, in which publication changes meaning. Hypertext, far more than any other aspect of computing, promises to make publication a matter of gaining access to electronic networks. For the time being

scholars will continue to rely on books, and one can guess that continuing improvements in desktop publishing and laser printing will produce a late efflorescence of the text as a physical object. Nonetheless, these physical texts will be produced (or rather reproduced) from electronic texts, and as readers increasingly become accustomed to the convenience of electronically linked texts, books, which now define the scholar's tools and end-products, will gradually lose their primary role in humanistic scholarship.

Books Are Technology, Too

We find ourselves, for the first time in centuries, able to see the book as unnatural, as a near-miraculous technological innovation and not as something intrinsically and inevitably human. We have, to use Derridean terms, decentered the book. We find ourselves in the position, in other words, of perceiving the book *as technology*. I think it no mere coincidence that it is at precisely this period in human history we have acquired crucial intellectual distance from the book as object and as cultural product. First came distant writing (the telegraph), next came distant hearing (the telephone), which was followed by the cinema and then the distant seeing of television. It is only with the added possibilities created by these new information media and computing that Harold Innis, Marshall McLuhan, Jack Goody, Elizabeth Eisenstein, Alvin Kernan, Roger Chartier, and the European scholars of *Lesengeshichte* could arise.

Influential as these scholars have been, not all scholars willingly recognize the power of information technologies on culture. As Geert Lovink, the Dutch advocate of the sociopolitical possibilities of the Internet, has wryly observed, "By and large, [the] humanities have been preoccupied with the impact of technology from a quasi-outsider's perspective, as if society and technology can still be separated" (*Dark Fiber*, 13). This resistance appears in two characteristic reactions to the proposition that information technology constitutes a crucial cultural force. First, one encounters a tendency among many humanists contemplating the possibility that information technology influences culture to assume that before now, before computing, our intellectual culture existed in some pastoral nontechnological realm. *Technology*, in the lexicon of many humanists, generally means "only that technology of which I am frightened." In fact, I have frequently heard humanists use the word *technology* to mean "some intrusive, alien force like computing," as if pencils, paper, typewriters, and printing presses were in some way *natural*. Digital technology may be new, but technology, particularly information technology, has permeated all known culture since the beginnings of human his-

tory. If we hope to discern the fate of reading and writing in digital environments, we must not treat all previous information technologies of language, rhetoric, writing, and printing as nontechnological.

As John Henry Cardinal Newman's *Idea of a University* reminds us, writers on education and culture have long tended to perceive only the negative effects of technology. To us who live in an age in which educators and pundits continually elevate reading books as an educational ideal and continually attack television as a medium that victimizes a passive audience, it comes as a shock to encounter Newman claiming that cheap, easily available reading materials similarly victimized the public. According to him,

> What the steam engine does with matter, the printing press is to do with mind; it is to act mechanically, and the population is to be passively, almost unconsciously enlightened, by the mere multiplication and dissemination of volumes. Whether it be the school boy, or the school girl, or the youth at college, or the mechanic in the town, or the politician in the senate, all have been the victims in one way or other of this most preposterous and pernicious of delusions. (108)

Part of Newman's rationale for thus denouncing cheap, abundant reading materials lies in the belief that they supposedly advance the dangerous fallacy that "learning is to be without exertion, without attention, without toil; without grounding, without advance, without finishing"; but, like any conservative elitist in our own day, he fears the people unsupervised, and he cannot believe that reading without proper guidance—guidance, that is, from those who know, from those in institutions like Oxford—can produce any sort of valid education, and, one expects, had Newman encountered the self-taught mill-workers and artisans of Victorian England who made discoveries in chemistry, astronomy, and geology after reading newly available books, he would not have been led to change his mind.

Like Socrates, who feared the effects of writing, which he took to be an anonymous, impersonal denaturing of living speech, Newman also fears an "impersonal" information technology that people can use without supervision. And also like Socrates, he desires institutions of higher learning—which for the ancient took the form of face-to-face conversation in the form of dialectic—to be sensitive to the needs of specific individuals. Newman therefore argues that "a University is, according to the usual designation, an Alma Mater, knowing her children one by one, not a foundry, or a mint, or a treadmill."

Newman's criticism of the flood of printed matter produced by the new technology superficially echoes Thomas Carlyle, whose "Signs of the Times"

(1829) had lambasted his age for being a mechanical one whose "true Deity is Mechanism." In fact, claims this first of Victorian sages,

not the external and physical alone is managed by machinery, but the internal and spiritual also. Here too nothing follows its spontaneous course, nothing is left to be accomplished by old, natural methods . . . Instruction, that mysterious communing of Wisdom with Ignorance, is no longer an indefinable tentative process, requiring a study of individual aptitudes, and a perpetual variation of means and methods, to attain the same end; but a secure, universal, straightforward business, to be conducted in the gross, by proper mechanism, with such intellect as comes to hand. (101)

Several things demand remark in this passage, the first and most obvious of which is that it parallels and might have provided one of the major inspirations for Newman's conceptions of education. The second recognition, which certainly shocks us more than does the first, is that Carlyle attacks those like Newman who propose educational systems and design institutions.

In sentences that I have omitted from the quoted passage, Carlyle explained that everything, with his contemporaries, "has its cunningly devised implements, its preestablished apparatus; it is not done by hand but by machinery. Thus we have machines for education: Lancasterian machines; Hamiltonian machines; monitors, maps, and emblems." Or, as Carlyle might say today, we have peer tutoring, core curricula, distribution requirements, work-study programs, and junior years abroad.

What is not at issue here is the practicality of Carlyle's criticisms of the mechanization of education and other human activities—after all, it would seem that he would attack any organizational change on the same grounds. No, what is crucial here is that Carlyle, who apparently denies all possibilities for reforming existing institutions, recognizes something crucial about them that Newman, the often admirable theorist of education, does not. Carlyle, in other words, recognizes that all institutions and forms of social organization are properly to be considered technologies. Carlyle, who pointed out elsewhere that gunpowder and the printing press destroyed feudalism, recognized that writing, printing, pedagogical systems, and universities are all technologies of cultural memory. Newman, like most academics of the past few hundred years, considers them, more naively, as natural and inevitable, and consequently notices the effects of only those institutions new to him or that he does not like.

The great value of such a recognition to our project here lies in the fact that it reminds us that electronifying universities does not take the form of technologizing them or adding technology to them in some way alien to their

essential spirit. Digital information technology, in other words, is only the latest to shape an institution that, as Carlyle reminds us, is both itself a form of technology, a mechanism, and has also long been influenced by those technologies on which it relies.

A second form of resistance to recognizing the role of information technology in culture appears in implicit claims that technology, particularly information technology, can *never* have cultural effects. Almost always presented by speakers and writers as evidence of their own sophistication and sensitivity, this strategy of denial has an unintended effect: denying that Gutenberg's invention or television can exist in a causal connection to any other aspect of culture immediately transforms technology—whatever the author means by that term—into a kind of intellectual monster, something so taboo that civilized people cannot discuss it in public. In other words, it takes technology, which is both an agent and effect of our continuing changing culture(s), and denies its existence as an element of human culture. One result appears in the strategies of historical or predictive studies that relate cultural phenomena to all sorts of economic, cultural, and ideological factors but avert their eyes from any technological causation, as if it, and only it, were in some way reductive. The effect, of course, finally is to deny that this particular form of cultural product can have any effect.

We have to remind ourselves that if, how, and whenever we move beyond the book, that movement will not embody a movement from something natural or human to something artificial—from nature to technology—since writing, and printing, and books are about as technological as one can get. Books, after all, are teaching and communicating *machines*. Therefore, if we find ourselves in a period of fundamental technological and cultural change analogous to the Gutenberg revolution, one of the first things we should do is remind ourselves that printed books are technology, too.

Analogues to the

Gutenberg Revolution

What can we predict about the future by understanding the "logic" of a particular technology or set of technologies? According to Kernan, "the 'logic' of a technology, an idea, or an institution is its tendency consistently to shape whatever it affects in a limited number of definite forms or directions" (49). The work of Kernan and others like Chartier and Eisenstein who have studied the complex transitions from manuscript to print culture suggest three clear lessons or rules for anyone anticipating similar transitions.

First of all, such transitions take a long time, certainly much longer than early studies of the shift from manuscript to print culture led one to expect.

Students of technology and reading practice point to several hundred years of gradual change and accommodation, during which different reading practices, modes of publication, and conceptions of literature obtained. According to Kernan, not until about 1700 did print technology "transform the more advanced countries of Europe from oral into print societies, reordering the entire social world, and restructuring rather than merely modifying letters" (9). How long, then, will it take computing, specifically computer hypertext, to effect similar changes? How long, one wonders, will the change to electronic language take until it becomes culturally pervasive? And what byways, transient cultural accommodations, and the like will intervene and thereby create a more confusing, if culturally more interesting, picture?

The second chief rule is that studying the relations of technology to literature and other aspects of humanistic culture does not produce any mechanical reading of culture, such as that feared by Jameson and others. As Kernan makes clear, understanding the logic of a particular technology cannot permit simple prediction because under varying conditions the same technology can produce varying, even contradictory, effects. J. David Bolter and other historians of writing have pointed out, for example, that initially writing, which served priestly and monarchical interests in recording laws and records, appeared purely elitist, even hieratic; later, as the practice diffused down the social and economic scale, it appeared democratizing, even anarchic. To a large extent, printed books had similarly diverse effects, though it took far less time for the democratizing factors to triumph over the hieratic— a matter of centuries, perhaps decades, instead of millennia!

Similarly, as Marie-Elizabeth Ducreux and Roger Chartier have shown, both printed matter and manuscript books functioned as instruments of "religious acculturation controlled by authority, but under certain circumstances [they] also supported resistance to a faith rejected, and proved an ultimate and secret recourse against forced conversion." Books of hours, marriage charters, and so-called evangelical books all embodied a "basic tension between public, ceremonial, and ecclesiastical use of the book or other print object, and personal, private, and internalized reading."[22]

Kernan himself points out that "knowledge of the leading principles of print logic, such as fixity, multiplicity, and systematization, makes it possible to predict the tendencies but not the *exact* ways in which they were to manifest themselves in the history of writing and in the world of letters. The idealization of the literary text and the attribution to it of a stylistic essence are both developments of latent print possibilities, but there was, I believe, no precise necessity beforehand that letters would be valorized in these particu-

lar ways" (181). Kernan also points to the "tension, if not downright contradiction, between two of the primary energies of print logic, multiplicity and fixity—what we might call 'the remainder house' and the 'library' effects" (55), each of which comes into play, or becomes dominant, only under certain economic, political, and technological conditions.

The third lesson or rule one can derive from the work of Kernan and other historians of the relations among reading practice, information technology, and culture is that transformations have political contexts and political implications. Considerations of hypertext, critical theory, and literature have to take into account what Jameson calls the basic "recognition that there is nothing that is not social and historical—indeed, that everything is 'in the last analysis' political" (*Political Unconscious*, 20).

If the technology of printing radically changed the world in the manner that Kernan convincingly explains, what, then, will be the effects of the parallel shift from print to computer hypertext? Although the changes associated with the transition from print to electronic technology may not parallel those associated with that from manuscript to print, paying attention to descriptions of the most recent shift in the technology of alphanumeric text provides areas for investigation.

One of the most important changes involved fulfilling the democratizing potential of the new information technology. During the shift from manuscript to print culture "an older system of polite or courtly letters—primarily oral, aristocratic, authoritarian, court-centered—was swept away . . . and gradually replaced by a new print-based, market-centered, democratic literary system" whose fundamental values "were, while not strictly determined by print ways, still indirectly in accordance with the actualities of print" (Kernan, *Printing Technologies*, 4). If hypertextuality and associated electronic information technologies have similarly pervasive effects, what will they be? Nelson, Miller, and almost all authors on hypertext who touch upon the political implications of hypertext assume that the technology is essentially democratizing and that it therefore supports some sort of decentralized, liberated existence. As our earlier brief glance at Internet search technology shows, networked electronic media have at least two contradictory logics—empowerment of individual readers and their vastly increased vulnerability to surveillance and consequent loss of privacy and security.

Kernan offers numerous specific instances of ways that technology "actually affects individual and social life." For example, "by changing their work and their writing, [print] forced the writer, the scholar, and the teacher—the standard literary roles—to redefine themselves, and if it did not entirely cre-

ate, it noticeably increased the importance and number of critics, editors, bibliographers, and literary historians." Print technology similarly redefined the audience for literature by transforming it from

a small group of manuscript readers or listeners . . . to a group of readers . . . who bought books to read in the privacy of their homes. Print also made literature objectively real for the first time, and therefore subjectively conceivable as a universal fact, in great libraries of printed books containing large collections of the world's writing . . . Print also rearranged the relationship of letters to other parts of the social world by, for example, freeing the writer from the need for patronage and the consequent subservience to wealth, by challenging and reducing established authority's control of writing by means of state censorship, and by pushing through a copyright law that made the author the owner of his own writing. (4–5)

Electronic linking shifts the boundaries between one text and another as well as between the author and the reader and between the teacher and the student. It also has radical effects on our experience of author, text, and work, redefining each. Its effects are so basic, so radical, that it reveals that many of our most cherished, most commonplace, ideas and attitudes toward literature and literary production turn out to be the result of that particular form of information technology and technology of cultural memory that has provided the setting for them. This technology—that of the printed book and its close relations, which include the typed or printed page—engenders certain notions of authorial property, authorial uniqueness, and a physically isolated text that hypertext makes untenable. The evidence of hypertext, in other words, historicizes many of our most commonplace assumptions, thereby forcing them to descend from the ethereality of abstraction and appear as corollary to a particular technology rooted in specific times and places. In making available these points, hypertext has much in common with some major points of contemporary literary and semiological theory, particularly with Derrida's emphasis on decentering and with Barthes's conception of the readerly versus the writerly text. In fact, hypertext creates an almost embarrassingly literal embodiment of both concepts, one that in turn raises questions about them and their interesting combination of prescience and historical relations (or embeddedness).

2

Hypertext and Critical Theory

Textual Openness

Like Barthes, Foucault, and Mikhail Bakhtin, Jacques Derrida continually uses the terms *link (liasons)*, *web (toile)*, *network (rèseau)*, and *interwoven (s'y tissent)*, which cry out for hypertextuality; but in contrast to Barthes, who emphasizes the writerly text and its nonlinearity, Derrida emphasizes textual openness, intertextuality, and the irrelevance of distinctions between inside and outside a particular text. These emphases appear with particular clarity when he claims that "like any text, the text of 'Plato' couldn't not be involved, or at least in a virtual, dynamic, lateral manner, with all the worlds that composed the system of the Greek language" (*Dissemination*, 129). Derrida in fact here describes extant hypertext systems in which the active reader in the process of exploring a text, probing it, can call into play dictionaries with morphological analyzers that connect individual words to cognates, derivations, and opposites. Here again something that Derrida and other critical theorists describe as part of a seemingly extravagant claim about language turns out precisely to describe the new economy of reading and writing with electronic virtual, rather than physical, forms.

Derrida properly recognizes (in advance, one might say) that a new, freer, richer form of text, one truer to our potential experience, perhaps to our actual if unrecognized experience, depends on discrete reading units. As he explains, in what Gregory Ulmer terms "the fundamental generalization of his writing" (*Applied Grammatology*, 58), there also exists "the possibility of disengagement and citational graft which belongs to the structure of every mark, spoken and written, and which constitutes every mark in writing before and outside of every horizon of semiolinguistic communication . . . Every sign, linguistic or non-linguistic, spoken or written . . . can be cited, put

between quotation marks." The implication of such citability, separability, appears in the fact, crucial to hypertext, that, as Derrida adds, "in so doing it can break with every given context, engendering an infinity of new contexts in a manner which is absolutely illimitable" ("Signature," 185).

Like Barthes, Derrida conceives of text as constituted by discrete reading units. Derrida's conception of text relates to his "methodology of decomposition" that might transgress the limits of philosophy. "The organ of this new philospheme," as Ulmer points out, "is the mouth, the mouth that bites, chews, tastes . . . The first step of decomposition is the bite" (*Applied Grammatology*, 57). Derrida, who describes text in terms of something close to Barthes's lexias, explains in *Glas* that "the object of the present work, its style too, is the 'mourceau,'" which Ulmer translates as "bit, piece, morsel, fragment; musical composition; snack, mouthful." This mourceau, adds Derrida, "is always detached, as its name indicates and so you do not forget it, with the teeth," and these teeth, Ulmer explains, refer to "quotation marks, brackets, parentheses: when language is cited (put between quotation marks), the effect is that of releasing the grasp or hold of a controlling context" (58).

Derrida's groping for a way to foreground his recognition of the way text operates in a print medium—he is, after all, the fierce advocate of writing as against orality—shows the position, possibly the dilemma, of the thinker working with print who sees its shortcomings but for all his brilliance cannot think his way outside this *mentalité*. Derrida, the experience of hypertext shows, gropes toward a new kind of text: he describes it, he praises it, but he can only present it in terms of the devices—here those of punctuation—associated with a particular kind of writing. As the Marxists remind us, thought derives from the forces and modes of production, though, as we shall see, few Marxists or Marxians ever directly confront the most important mode of literary production—that dependent on the *techne* of writing and print.

From this Derridean emphasis on discontinuity comes the conception of hypertext as a vast assemblage, what I have elsewhere termed the *metatext* and what Nelson calls the *docuverse*. Derrida in fact employs the word *assemblage* for cinema, which he perceives as a rival, an alternative, to print. Ulmer points out that "the gram or trace provides the 'linguistics' for collage/montage" (*Applied Grammatology*, 267), and he quotes Derrida's use of *assemblage* in *Speech and Phenomena:* "The word 'assemblage' seems more apt for suggesting that the kind of bringing-together proposed here has the structure of an interlacing, a weaving, or a web, which would allow the different threads and different lines of sense or force to separate again, as well as being ready to bind others together" (131). To carry Derrida's instinctive theorizing of

hypertext further, one may also point to his recognition that such a montage-like textuality marks or foregrounds the writing process and therefore rejects a deceptive transparency.

Hypertext and Intertextuality

Hypertext, which is a fundamentally intertextual system, has the capacity to emphasize intertextuality in a way that page-bound text in books cannot. As we have already observed, scholarly articles and books offer an obvious example of *explicit* hypertextuality in nonelectronic form. Conversely, any work of literature—which for the sake of argument and economy I shall here confine in a most arbitrary way to mean "high" literature of the sort we read and teach in universities—offers an instance of *implicit* hypertext in nonelectronic form. Again, take Joyce's *Ulysses* for an example. If one looks, say, at the Nausicaa section, in which Bloom watches Gerty McDowell on the beach, one notes that Joyce's text here "alludes" or "refers" (the terms we usually employ) to many other texts or phenomena that one can treat as texts, including the Nausicaa section of the *Odyssey*, the advertisements and articles in the women's magazines that suffuse and inform Gerty's thoughts, facts about contemporary Dublin and the Catholic Church, and material that relates to other passages within the novel. Again, a hypertext presentation of the novel links this section not only to the kinds of materials mentioned but also to other works in Joyce's career, critical commentary, and textual variants. Hypertext here permits one to make explicit, though not necessarily intrusive, the linked materials that an educated reader perceives surrounding it.

Thaïs Morgan suggests that intertextuality, "as a structural analysis of texts in relation to the larger system of signifying practices or uses of signs in culture," shifts attention from the triad constituted by author/work/tradition to another constituted by text/discourse/culture. In so doing, "intertextuality replaces the evolutionary model of literary history with a structural or synchronic model of literature as a sign system. The most salient effect of this strategic change is to free the literary text from psychological, sociological, and historical determinisms, opening it up to an apparently infinite play of relationships" (1–2). Morgan well describes a major implication of hypertext (and hypermedia) intertextuality: such opening up, such freeing one to create and perceive interconnections, obviously occurs. Nonetheless, although hypertext intertextuality would seem to devalue any historic or other reductionism, it in no way prevents those interested in reading in terms of author and tradition from doing so. Scholarship and criticism in hypertext from Intermedia and HyperCard to Weblogs demonstrates that hypertext does not

necessarily turn one's attention away from such approaches. What is perhaps most interesting about hypertext, though, is not that it may fulfill certain claims of structuralist and poststructuralist criticism but that it provides a rich means of testing them.

Hypertext and Multivocality

In attempting to imagine the experience of reading and writing with (or within) this new form of text, one would do well to pay heed to what Mikhail Bakhtin has written about the dialogic, polyphonic, multivocal novel, which he claims "is constructed not as the whole of a single consciousness, absorbing other consciousnesses as objects into itself, but as a whole formed by the interaction of several consciousnesses, none of which entirely becomes an object for the other" (18). Bakhtin's description of the polyphonic literary form presents the Dostoevskian novel as a hypertextual fiction in which the individual voices take the form of lexias.

If Derrida illuminates hypertextuality from the vantage point of the "bite" or "bit," Bakhtin illuminates it from the vantage point of its own life and force—its incarnation or instantiation of a voice, a point of view, a Rortyian conversation.[1] Thus, according to Bakhtin, "in the novel itself, nonparticipating 'third persons' are not represented in any way. There is no place for them, compositionally or in the larger meaning of the work" (18). In terms of hypertextuality this points to an important quality of this information medium: complete read-write hypertext (exemplified by blogs and Intermedia) does not permit a tyrannical, univocal voice. Rather, the voice is always that distilled from the combined experience of the momentary focus, the lexia one presently reads, and the continually forming narrative of one's reading path.

Hypertext and Decentering

As readers move through a web or network of texts, they continually shift the center—and hence the focus or organizing principle—of their investigation and experience. Hypertext, in other words, provides an infinitely recenterable system whose provisional point of focus depends on the reader, who becomes a truly active reader in yet another sense. One of the fundamental characteristics of hypertext is that it is composed of bodies of linked texts that have no primary axis of organization. In other words, the metatext or document set—the entity that describes what in print technology is the book, work, or single text—has no center. Although this absence of a center can create problems for the reader and the writer, it also means that anyone who uses hypertext makes his or her own interests the de facto organizing principle (or center) for the investigation

at the moment. One experiences hypertext as an infinitely decenterable and recenterable system, in part because hypertext transforms any document that has more than one link into a transient center, a partial sitemap that one can employ to orient oneself and to decide where to go next.

Western culture imagined quasi-magical entrances to a networked reality long before the development of computing technology. Biblical typology, which played such a major role in English culture during the seventeenth and nineteenth centuries, conceived sacred history in terms of types and shadows of Christ and his dispensation. Thus, Moses, who existed in his own right, also existed as Christ, who fulfilled and completed the prophet's meaning. As countless seventeenth-century and Victorian sermons, tracts, and commentaries demonstrate, any particular person, event, or phenomenon acted as a magical window into the complex semiotic of the divine scheme for human salvation. Like the biblical type, which allows significant events and phenomena to participate simultaneously in many realities or levels of reality, the individual lexia inevitably provides a way into the network of connections. Given that Evangelical Protestantism in America preserves and extends these traditions of biblical exegesis, one is not surprised to discover that some of the first applications of hypertext involved the Bible and its exegetical tradition.[2]

Not only do lexias work much in the manner of types, they also become Borgesian Alephs, points in space that contain all other points, because from the vantage point each provides one can see everything else—if not exactly simultaneously, then a short way distant, one or two jumps away, particularly in systems that have full text searching. Unlike Jorge Luis Borges's Aleph, one does not have to view it from a single site, neither does one have to sprawl in a cellar resting one's head on a canvas sack.[3] The hypertext document becomes a traveling Aleph.

As Derrida points out in "Structure, Sign, and Play in the Discourse of the Human Sciences," the process or procedure he calls decentering has played an essential role in intellectual change. He says, for example, that "ethnology could have been born as a science only at the moment when a de-centering had come about: at the moment when European culture—and, in consequence, the history of metaphysics and of its concepts—had been dislocated, driven from its locus, and forced to stop considering itself as the culture of reference" (251). Derrida makes no claim that an intellectual or ideological center is in any way bad, for, as he explains in response to a query from Serge Doubrovsky, "I didn't say that there was no center, that we could get along without a center. I believe that the center is a function, not a being—a reality, but a function. And this function is absolutely indispensable" (271).

All hypertext systems permit the individual reader to choose his or her own center of investigation and experience. What this principle means in practice is that the reader is not locked into any kind of particular organization or hierarchy. Experiences with various hypertext systems reveal that for those who choose to organize a session on the system in terms of authors—moving, say, from Keats to Tennyson—the system represents an old-fashioned, traditional, and in many ways still useful author-centered approach. On the other hand, nothing constrains the reader to work in this manner, and readers who wish to investigate the validity of period generalizations can organize their sessions in terms of such periods by using the Victorian and Romantic overviews as starting points or midpoints while yet others can begin with ideological or critical notions, such as feminism or the Victorian novel. In practice most readers employ the materials in *The Victorian Web* as a text-centered system, since they tend to focus on individual works, with the result that even if they begin sessions by looking for information about an individual author, they tend to spend most time with lexias devoted to specific texts, moving between poem and poem (Swinburne's "Laus Veneris" and Keats's "La Belle Dame Sans Merci" or works centering on Ulysses by Joyce, Tennyson, and Soyinka) and between poem and informational texts ("Laus Veneris" and files on chivalry, medieval revival, courtly love, Wagner, and so on).

Hypertext as Rhizome

Shortly after I began to teach hypertext and critical theory, Tom Meyer, a member of my first class, advised me that Gilles Deleuze and Félix Guattari's *1,000 Plateaus* demanded a place in *Hypertext*. And he is clearly right. Anyone considering the subject of this book has to look closely at their discussion of rhizomes, plateaus, and nomadic thought for several obvious reasons, only the most obvious of which is that they present *1,000 Plateaus* as a print protohypertext. Like Julio Cortzàr's *Hopscotch*, their volume comes with instructions to read it in various reader-determined orders, so that, as Stuart Moulthrop explains, their "rhizome-book may itself be considered an incunabular hypertext . . . designed as a matrix of independent but cross-referential discourses which the reader is invited to enter more or less at random (Deleuze and Guattari, xx)" and read in any order. "The reader's implicit task," Moulthrop explains, "is to build a network of virtual connections (which more than one reader of my acquaintance has suggested operationalizing as a web of hypertext links)" ("Rhizome and Resistance," 300–301).

Certainly, many of the qualities Deleuze and Guattari attribute to the rhizome require hypertext to find their first approximation if not their complete

answer or fulfillment. Thus, their explanation of a plateau accurately describes the way both individual lexias and clusters of them participate in a web. "A plateau," they explain, "is always in the middle, not at the beginning or the end. A rhizome is made of plateaus. Gregory Bateson uses the word 'plateau' to designate something very special: a continuous, self-vibrating region of intensities whose development avoids any orientation toward a culmination point or external end" (21–22), such as orgasm, victory in war, or other point of culmination. Deleuze and Guattari, who criticize the "Western mind" for relating "expressions and actions to exterior or transcendent ends, instead of evaluating them on a plane of consistency on the basis of their intrinsic value," take the printed book to exemplify such characteristic climactic thought, explaining that "a book composed of chapters has culmination and termination points" (22).

Like Derrida and like the inventors of hypertext, they propose a newer form of the book that might provide a truer, more efficient information technology, asking: "What takes place in a book composed instead of plateaus that communicate with one another across microfissures, as in a brain? We call a 'plateau' any multiplicity connected to other multiplicities by superficial underground stems in such a way as to form or extend a rhizome" (22). Such a description, I should add, perfectly matches the way clusters or subwebs organize themselves in large networked hypertext environments, such as the World Wide Web. In fact, reducing Deleuze and Guattari's grand prescription to relatively puny literal embodiment, one could take the sections concerning Gaskell and Trollope in *The Victorian Web,* or the individual diary entries in Phil Gyford's Weblog version of Samuel Pepys's *Diaries,* as embodiments of plateaus. Indeed, one of the principles of reading and writing hypermedia—as in exploring a library of printed books—lies in the fact that one can begin anywhere and make connections, or, as Deleuze and Guattari put it, "each plateau can be read starting anywhere and can be related to any other plateau."

Such a characteristic organization (or lack of it) derives from the rhizome's fundamental opposition to hierarchy, a structural form whose embodiment Deleuze and Guattari find in the arborescent: "unlike trees or their roots, the rhizome connects any point to any other point, and its traits are not necessarily linked to traits of the same nature; it brings into play very different regimes of signs, and even nonsign states" (21). As Meyer explains in *Plateaus,* a Storyspace web that has since been published as part of *Writing at the Edge,* we generally rely on "arborescent structures," such as binary thought, genealogies, and hierarchies, to divide the "seemingly endless stream of information about the world into more easily assimilable bits. And, for this

purpose, these structures serve admirably." Unfortunately, these valuable "organizational tools end up becoming the only methods of understanding," and limit instead of enhance or liberate our thought. "In contrast, Deleuze and Guattari propose the rhizome as a useful model for analysing structures—the potato, the strawberry plant, with their thickenings and shifting connections, with their network-like structure instead of a tree-like one" ("Tree/Rhizome").

This fundamental network structure explains why

the rhizome is reducible neither to the One nor the multiple . . . It has neither beginning nor end, but always a middle (milieu) from which it grows and which it overspills . . . When a multiplicity of this kind changes dimension, it necessarily changes in nature as well, undergoes a metamorphosis . . . The rhizome is an antigenealogy. It is a short-term memory, or antimemory. The rhizome operates by variation, expansion, conquest, capture, offshoots. Unlike the graphic arts, drawing, or photography, unlike tracings, the rhizome pertains to a map that must be produced, constructed, a map that is always detachable, connectable, reversible, modifiable, and has multiple entryways and exits and its own lines of flight . . . In contrast to centered (even polycentric) systems with hierarchical modes of communication and preestablished paths, the rhizome is an acentered, nonhierarchical, nonsignifying system without a General and without an organizing memory or central automaton, defined solely by a circulation of states. (21)

As we explore hypertext in the following pages, we shall repeatedly encounter the very qualities and characteristics Deleuze and Guattari here specify: like the rhizome, hypertext, which has "has multiple entryways and exits," embodies something closer to anarchy than to hierarchy, and it "connects any point to any other point," often joining fundamentally different kinds of information and often violating what we understand to be both discrete print texts and discrete genres and modes.

Any reader of hypertext who has experienced the way our own activities within the networked text produce multiple versions and approaches to a single lexia will see the parallel to hypertext in Deleuze and Guattari's point that "multiplicities are rhizomatic, and expose arborescent pseudomultiplicities for what they are. There is no unity to serve as a pivot in the object, or to divide in the subject" (8). Therefore, like hypertext considered in its most general sense, "a rhizome is not amenable to any structural or generative model. It is a stranger to any idea of genetic axis or deep structure" (12). As Deleuze and Guattari explain, a rhizome is "a map and not a tracing. Make a map, not a tracing. The orchid does not reproduce the tracing of the wasp; it forms a map with the wasp, in a rhizome. What distinguishes the map from the trac-

ing is that it is entirely oriented toward an experimentation in contact with the real" (12). Maps and hypertexts both, in other words, relate directly to performance, to interaction.

Like some statements by Derrida, some of Deleuze and Guattari's more cryptic discussions of the rhizome often become clearer when considered from the vantage point of hypertext. For example, when they state that the rhizome is a "a short-term memory, or antimemory," something apparently in complete contrast with any information technology or technology of cultural memory, they nonetheless capture the provisional, temporary, changing quality in which readers make individual lexias the temporary center of their movement through an information space.

Perhaps one of the most difficult portions of *A Thousand Plateaus* involves the notion of nomadic thought, something, again, much easier to convey and experience in a fluid electronic environment than from within the world of print. According to Michael Joyce, the first important writer of hypertext fiction and one of the creators of Storyspace, Deleuze and Guattari reject "the word and world fully mapped as logos," proposing instead that "we write ourselves in the gap of nomos, the nomadic" (*Of Two Minds,* 207). They offer or propose, he explains, "being-for space against being-in space. We are in the water, inscribing and inscribed by the flow in our sailing. We write ourselves in oscillation between the smooth space of being for-time (what happens to us as we go as well as what happens to the space in which we do so) and the striated space of in-time (what happens outside the space and us)" (207).

Those who find the ruptures and seams as important to hypertext as the link that bridges such gaps find that the rhizome has yet another crucial aspect of hypertextuality. Moulthrop, for example, who "describes hypertexts as composed of nodes and links, local coherences and linearities broken across the gap or synapse of transition," takes this approach: "In describing the rhizome as a model of discourse, Deleuze and Guattari invoke the 'principle of asignifying rupture' (9), a fundamental tendency toward unpredictability and discontinuity. Perhaps then hypertext and hypermedia represent the expression of the rhizome in the social space of writing" ("Rhizome and Resistance," 304).

We must take care not to push the similarity too far and assume that their descriptions of rhizome, plateau, and nomadic thought map one to one onto hypertext, since many of their descriptions of the rhizome and rhizomatic thought appear impossible to fulfill in any information technology that uses words, images, or limits of any sort. Thus when Deleuze and Guattari write that a rhizome "has neither beginning nor end, but always a middle (milieu)

from which it grows and which it overspills," they describe something that has much in common with the kind of quasi-anarchic networked hypertext one encounters on the World Wide Web, but when the following sentence adds that the rhizome "is composed not of units but of dimensions, or rather directions in motion" (21), the parallel seems harder to complete. The rhizome is essentially a counterparadigm, not something realizable in any time or culture, but it can serve as an ideal for hypertext, and hypertext, at least Nelsonian, ideal hypertext, approaches it as much as can any human creation.

The Nonlinear Model of the Network in Current Critical Theory

Discussions and designs of hypertext share with contemporary critical theory an emphasis on the model or paradigm of the network. At least four meanings of *network* appear in descriptions of actual hypertext systems and plans for future ones. First, individual print works when transferred to hypertext take the form of blocks, nodes, or lexias joined by a network of links and paths. Network, in this sense, refers to one kind of electronically linked electronic equivalent to a printed text. Second, any gathering of lexias, whether assembled by the original author of the verbal text, or by someone else gathering together texts created by multiple authors, also takes the form of a network; thus document sets, whose shifting borders make them in some senses the hypertextual equivalent of a work, are called in some present systems a web.

Third, the term *network* also refers to an electronic system involving additional computers as well as cables or wire connections that permit individual machines, workstations, and reading-and-writing sites to share information. These networks can take the form of contemporary Local Area Networks (LANs), such as Ethernet, that join sets of machines within an institution or a part of one, such as a department or administrative unit. Networks also take the form of Wide Area Networks (WANs) that join multiple organizations in widely separated geographical locations. Early versions of such wide-area national and international networks include JANET (in the United Kingdom), ARPANET (in the United States), the proposed National Research and Education Network (NREN), and BITNET, which linked universities, research centers, and laboratories in North America, Europe, Israel, and Japan.[4] Such networks, which until the arrival of the World Wide Web had been used chiefly for electronic mail and transfer of individual files, have also supported international electronic bulletin boards, such as Humanist. More powerful networks that transfer large quantities of information at great speed were necessary before such networks could fully support hypertext.

The fourth meaning of network in relation to hypertext comes close to matching the use of the term in critical theory. Network in this fullest sense refers to the entirety of all those terms for which there is no term and for which other terms stand until something better comes along, or until one of them gathers fuller meanings and fuller acceptance to itself: *literature, infoworld, docuverse,* in fact, *all writing* in the alphanumeric as well as Derridean senses. The future wide area networks necessary for large-scale, interinstitutional and intersite hypertext systems will instantiate and reify the current information worlds, including that of literature. To gain access to information, in other words, will require access to some portion of the network. To publish in a hypertextual world requires gaining access, however limited, to the network.

The analogy, model, or paradigm of the network so central to hypertext appears throughout structuralist and poststructuralist theoretical writings. Related to the model of the network and its components is a rejection of linearity in form and explanation, often in unexpected applications. One example of such antilinear thought will suffice. Although narratologists have almost always emphasized the essential linearity of narrative, critics have recently begun to find it to be nonlinear. Barbara Herrnstein Smith, for example, argues that "by virtue of the very nature of discourse, nonlinearity is the rule rather than the exception in narrative accounts" ("Narrative Versions, Narrative Theories," 223). Since I shall return to the question of linear and nonlinear narrative in a later chapter, I wish here only to remark that nonlinearity has become so important in contemporary critical thought, so fashionable, one might say, that Smith's observation, whether accurate or not, has become almost inevitable.

The general importance of non- or antilinear thought appears in the frequency and centrality with which Barthes and other critics employ the terms *link, network, web,* and *path.* More than almost any other contemporary theorist, Derrida uses the terms *link, web, network, matrix,* and *interweaving* associated with hypertextuality; and Bakhtin similarly employs *links (Problems,* 9, 25), *linkage* (9), *interconnectedness* (19), and *interwoven* (72).

Like Barthes, Bakhtin, and Derrida, Foucault conceives of text in terms of the network, and he relies precisely on this model to describe his project, "the archaeological analysis of knowledge itself." Arguing in *The Order of Things* that his project requires rejecting the "celebrated controversies" that occupied contemporaries, he claims that "one must reconstitute the general system of thought whose network, in its positivity, renders an interplay of simultaneous and apparently contradictory opinions possible. It is this network that defines the conditions that make a controversy or problem possible, and that bears the

historicity of knowledge" (75). Order, for Foucault, is in part "the inner law, the hidden network" (xx); and according to him a "network" is the phenomenon "that is able to link together" (127) a wide range of often contradictory taxonomies, observations, interpretations, categories, and rules of observation.

Heinz Pagels's description of a network in *The Dreams of Reason* suggests why it has such appeal to those leery of hierarchical or linear models. According to Pagels, "A network has no 'top' or 'bottom.' Rather it has a plurality of connections that increase the possible interactions between the components of the network. There is no central executive authority that oversees the system" (20). Furthermore, as Pagels also explains, the network functions in various physical sciences as a powerful theoretical model capable of describing—and hence offering research agenda for—a range of phenomena at enormously different temporal and spatial scales. The model of the network has captured the imaginations of those working on subjects as apparently diverse as immunology, evolution, and the brain.

The immune system, like the evolutionary system, is thus a powerful pattern-recognition system, with capabilities of learning and memory. This feature of the immune system has suggested to a number of people that a dynamical computer model, simulating the immune system, could also learn and have memory . . . The evolutionary system works on the time scale of hundreds of thousands of years, the immune system in a matter of days, and the brain in milliseconds. Hence if we understand how the immune system recognizes and kills antigens, perhaps it will teach us about how neural nets recognize and can kill ideas. After all, both the immune system and the neural network consist of billions of highly specialized cells that excite and inhibit one another, and they both learn and have memory. (134–35)

Terry Eagleton and other Marxist theorists who draw on poststructuralism frequently employ the kind of network model or image to which the connectionists subscribe (see Eagleton, *Literary Theory*, 14, 33, 78, 104, 165, 169, 173, 201). In contrast, more orthodox Marxists, who have a vested interest (or sincere belief) in linear narrative and metanarrative, tend to use *network* and *web* chiefly to characterize error. Pierre Macherey might therefore at first appear slightly unusual in following Barthes, Derrida, and Foucault in situating novels within a network of relations to other texts. According to Machery, "The novel is initially situated in a network of books which replaces the complexity of real relations by which a world is effectively constituted." Machery's next sentence, however, makes clear that unlike most poststructuralists and postmodernists who employ the network as a paradigm of an open-ended, non-

confining situation, he perceives a network as something that confines and limits: "Locked within the totality of a corpus, within a complex system of relationships, the novel is, in its very letter, allusion, repetition, and resumption of an object which now begins to resemble an inexhaustible world" (268).

Frederic Jameson, who attacks Louis Althusser in *The Political Unconscious* for creating impressions of "facile totalization" and of "a seamless web of phenomena" (27), himself more explicitly and more frequently makes these models the site of error. For example, when he criticizes the "anti-speculative bias" of the liberal tradition in *Marxism and Form,* he notes "its emphasis on the individual fact or item at the expense of the network of relationships in which that item may be imbedded" as liberalism's means of keeping people from "drawing otherwise unavoidable conclusions at the political level" (x). The network model here represents a full, adequate contextualization, one suppressed by an other-than-Marxist form of thought, but it is still only necessary in describing pre-Marxian society. Jameson repeats this paradigm in his chapter on Herbert Marcuse when he explains that "genuine desire risks being dissolved and lost in the vast network of pseudosatisfactions which make up the market system" (100–101). Once again, network provides a paradigm apparently necessary for describing the complexities of a fallen society. It does so again when in the Sartre chapter he discusses Marx's notion of fetishism, which, according to Jameson, presents "commodities and the 'objective' network of relationships which they entertain with each other" as the illusory appearance masking the "reality of social life," which "lies in the labor process itself" (296).

Cause or Convergence, Influence or Confluence?

What relation obtains between electronic computing, hypertext in particular, and literary theory of the past three or four decades? J. Hillis Miller proposes that "the relation . . . is multiple, non-linear, non-causal, non-dialectical, and heavily overdetermined. It does not fit most traditional paradigms for defining 'relationship'" ("Literary Theory," 11). Miller himself provides a fine example of the convergence of critical theory and technology. Before he discovered computer hypertext, he wrote about text and (interpretative) text processing in ways that sound very familiar to anyone who has read or worked with hypertext. Here, for example, is the way *Fiction and Repetition* describes the way he reads a novel by Hardy in terms of what I would term a *Bakhtinian hypertextuality:* "Each passage is a node, a point of intersection or focus, on which converge lines leading from many other passages in the novel and ultimately including

them all." No passage has any particular priority over the others, in the sense of being more important or as being the "origin or end of the others" (58).

Similarly, in providing "an 'example' of the deconstructive strategy of interpretation," in "The Critic as Host" (1979), he describes the dispersed, linked text block whose paths one can follow to an ever-widening, enlarging metatext or universe. He applies deconstructive strategy "to the cited fragment of a critical essay containing within itself a citation from another essay, like a parasite within its host." Continuing the microbiological analogy, Miller next explains that "the 'example' is a fragment like those miniscule bits of some substance which are put into a tiny test tube and explored by certain techniques of analytical chemistry. [One gets] so far or so much out of a little piece of language, context after context widening out from these few phrases to include as their necessary milieux all the family of Indo-European languages, all the literature and conceptual thought within these languages, and all the permutations of our social structures of household economy, gift-giving and gift receiving" (223).

Miller does point out that Derrida's "*Glas* and the personal computer appeared at more or less the same time. Both work self-consciously and deliberately to make obsolete the traditional codex linear book and to replace it with the new multilinear multimedia hypertext that is rapidly becoming the characteristic mode of expression both in culture and in the study of cultural forms. The 'triumph of theory' in literary studies and their transformation by the digital revolution are aspects of the same sweeping change" ("Literary Theory," 20–21). This sweeping change has many components, to be sure, but one theme appears both in writings on hypertext (and the memex) and in contemporary critical theory—the limitations of print culture, the culture of the book. Bush and Barthes, Nelson and Derrida, like all theorists of these perhaps unexpectedly intertwined subjects, begin with the desire to enable us to escape the confinements of print. This common project requires that one first recognize the enormous power of the book, for only after we have made ourselves conscious of the ways it has formed and informed our lives can we seek to pry ourselves free from some of its limitations.

Looked at within this context, Claude Lèvi-Strauss's explanations of preliterate thought in *The Savage Mind* and in his treatises on mythology appear in part as attempts to decenter the culture of the book—to show the confinements of our literate culture by getting outside of it, however tenuously and however briefly. In emphasizing electronic, noncomputer media, such as radio, television, and film, Baudrillard, Derrida, Jean-François

Lyotard, McLuhan, and others similarly argue against the future importance of print-based information technology, often from the vantage point of those who assume analogue media employing sound and motion as well as visual information will radically reconfigure our expectations of human nature and human culture.

Among major critics and critical theorists, Derrida stands out as the one who most realizes the importance of free-form information technology based on digital, rather than analogue, systems. As he points out, "the development of *practical methods* of information retrieval extends the possibilities of the 'message' vastly, to the point where it is no longer the 'written' translation of a language, the transporting of a signified which could remain spoken in its integrity" (10). Derrida, more than any other major theorist, understands that electronic computing and other changes in media have eroded the power of the linear model and the book as related culturally dominant paradigms. "The end of linear writing," Derrida declares, "is indeed the end of the book," even if, he continues, "it is within the form of a book that the new writings—literary or theoretical—allow themselves to be, for better or worse, encased" (*Of Grammatology,* 86). Therefore, as Ulmer points out, "grammatalogical writing exemplifies the struggle to break with the investiture of the book" (13).

According to Derrida, "the form of the 'book' is now going through a period of general upheaval, and while that form appears less natural, and its history less transparent, than ever . . . the book form alone can no longer settle . . . the case of those writing processes which, in *practically* questioning that form, must also dismantle it." The problem, too, Derrida recognizes, is that "one cannot tamper" with the form of the book "without disturbing everything else" (*Dissemination,* 3) in Western thought. Always a tamperer, Derrida does not find that much of a reason for not tampering with the book, and his questioning begins in the chain of terms that appear as the more-or-less title at the beginning pages of *Dissemination:* "Hors Livres: Outwork, Hors D'oeuvre, Extratext, Foreplay, Bookend, Facing, and Prefacing." He does so willingly because, as he announced in *Of Grammatology,* "All appearances to the contrary, this death of the book undoubtedly announces (and in a certain sense always has announced) nothing but a death of speech (of a *so-called* full speech) and a new mutation in the history of writing, in history as writing. Announces it at a distance of a few centuries. It is on that scale that we must reckon it here" (8).

In conversation with me, Ulmer mentioned that since Derrida's gram equals link, grammatology is the art and science of linking—the art and

science, therefore, of hypertext.[5] One may add that Derrida also describes dissemination as a description of hypertext: "Along with an ordered extension of the concept of text, dissemination inscribes a different law governing the effects of sense or reference (the interiority of the 'thing,' reality, objectivity, essentiality, existence, sensible or intelligible presence in general, etc.), a different relation between writing, in the metaphysical sense of the word, and its 'outside' (historical, political, economical, sexual, etc.)" (*Dissemination*, 42).

3

Reconfiguring the Text

From Text to Hypertext

Although in some distant, or not-so-distant, future all individual texts will electronically link to one another, thus creating metatexts and metametatexts of a kind only partly imaginable at present, less far-reaching forms of hypertextuality have already appeared. Translations into hypertextual form already exist of poetry, fiction, and other materials originally conceived for book technology. The simplest, most limited form of such translation preserves the linear text with its order and fixity and then appends various kinds of texts to it, including critical commentary, textual variants, and chronologically anterior and later texts.[1]

Hypertext corpora that employ a single text, originally created for print dissemination, as an unbroken axis off which to hang annotation and commentary appear in the by-now common educational and scholarly presentations of canonical literary texts (Figure 7). At Brown University my students and I first used Intermedia and Storyspace to provide annotated versions of stories by Kipling and Lawrence, and I have since created more elaborate World Wide Web presentations of Carlyle's "Hudson's Statue" and other texts. *The Dickens Web,* a corpus of materials focused on *Great Expectations* published in Intermedia (IRIS, 1990) and Storyspace (Eastgate, 1992), differs from these projects in not including the primary text, as does Christiane Paul's *Unreal City: A Hypertext Guide to T. S. Eliot's "The Waste Land"* (1994).

A second case appears when one adapts for hypertextual presentation material originally conceived for book technology that divides into discrete lexias, particularly if it has multilinear elements that call for the kind of multisequential reading associated with hypertext. An early example of this form of hypertext appears in Brian Thomas's early HyperCard version of *Imitatio*

Axial structure characteristic of electronic books and scholarly books with foot- or endnotes
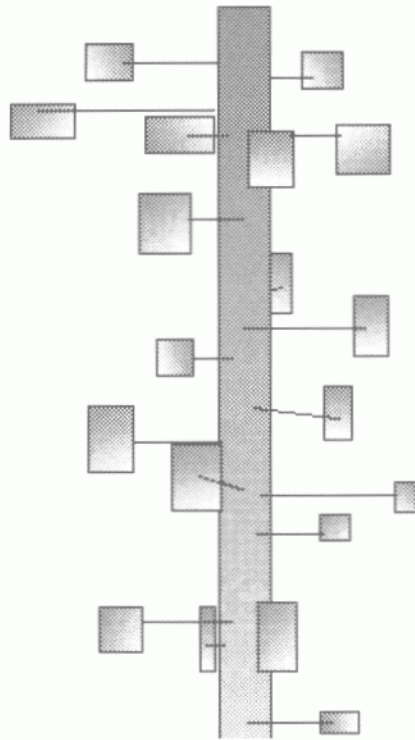
versus

Network structure of hypertext
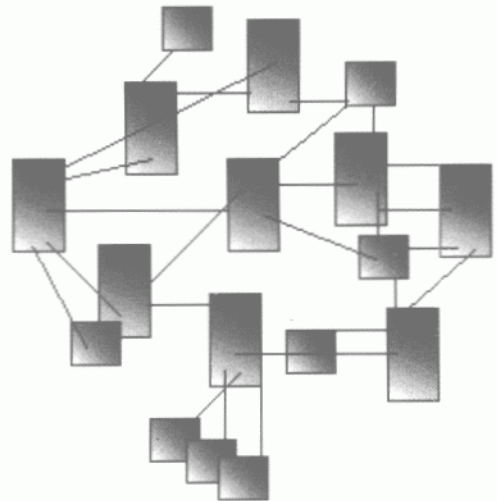
1. Where does the reader enter the text?

2. Where does the reader leave the text?

3. Where are the borders of the text?

Figure 7. Axial versus Network Structure in Hypertext

Cristi, and another is the electronic edition of the *New Oxford Annotated Bible* (1995), a hypertext presentation of the Revised Standard Version that uses AND Software's CompLex system. Like many commercially available electronic texts, the *New Oxford Annotated Bible* appears more a digitized book than a true hypertext, though it is nonetheless valuable for that. Readers can supplement the biblical text with powerful search tools and various indices, including ones for Bible and annotation topics, and substantial supplementary essays, including those on approaches to Bible study, literary forms in the Gospels, and the characteristics of Hebrew poetry. The *New Oxford Annotated Bible*'s hypertextuality consists largely of variant readings (indicated by link

icons in the form of red crosses) and the fact that readers can add both book-marks and their own annotations.

A more elaborate form of hypertextuality appears in the earlier *CD Word: The Interactive Bible Library,* which a team based at Dallas Theological Seminary created using an enhanced version of Guide™. This hypertext Bible corpus, "intended for the student, theologian, pastor, or lay person" rather than for the historian of religion, includes the King James, New International, New American Standard, and Revised Standard versions of the Bible, as well as Greek texts for the New Testament and Septuagint. These materials are supplemented by three Greek lexica, two Bible dictionaries, and three Bible commentaries (DeRose, *CD Word,* 1, 117–26). Using this system, which stores the electronic texts on a compact disc, the Bible reader can juxtapose passages from different versions and compare variants, examine the original Greek, and receive rapid assistance on Greek grammar and vocabulary.

A similar kind of corpus that uses a more sophisticated hypertext system is Paul D. Kahn's pioneering *Chinese Literature* Intermedia web, which offers different versions of the poetry of Tu Fu (712–770), ranging from the Chinese text, Pin-yin transcriptions, and literal translations to much freer ones by Kenneth Rexroth and others. *Chinese Literature* also includes abundant secondary materials that support interpreting Tu Fu's poetry. Like *CD Word,* Kahn's Intermedia corpus permits both beginning and advanced students to approach a canonical text in a foreign language through various versions, and like the hypertext Bible on compact disc, it also situates its primary text within a network of links to both varying translations and reference materials.

Before considering other kinds of hypertext, we should note the implicit justifications or rationales for these two successful projects. *CD Word* presents its intended readers with a particularly appropriate technological presentation of the Bible because they habitually handle this text in terms of brief passages—or, as writers on hypertext might put it, as if it had "fine granularity." Because the individual poems of Tu Fu are fairly brief, a body of them invites similar conversion to hypertext.

The *In Memoriam* Web

In contrast to the *CD Word Bible* and the *Chinese Literature Web,* which support study chiefly by electronically linking multiple parallel texts, the *In Memoriam* web (Figure 8), another Intermedia corpus created at Brown University and since published in Storyspace (Figure 9) after an extensive expansion by Jon Lanestedt and me (Eastgate Systems, 1992), uses electronic links to map and hence reify a text's internal and external allusions and references—its *inter-* and *intra*textuality.[2]
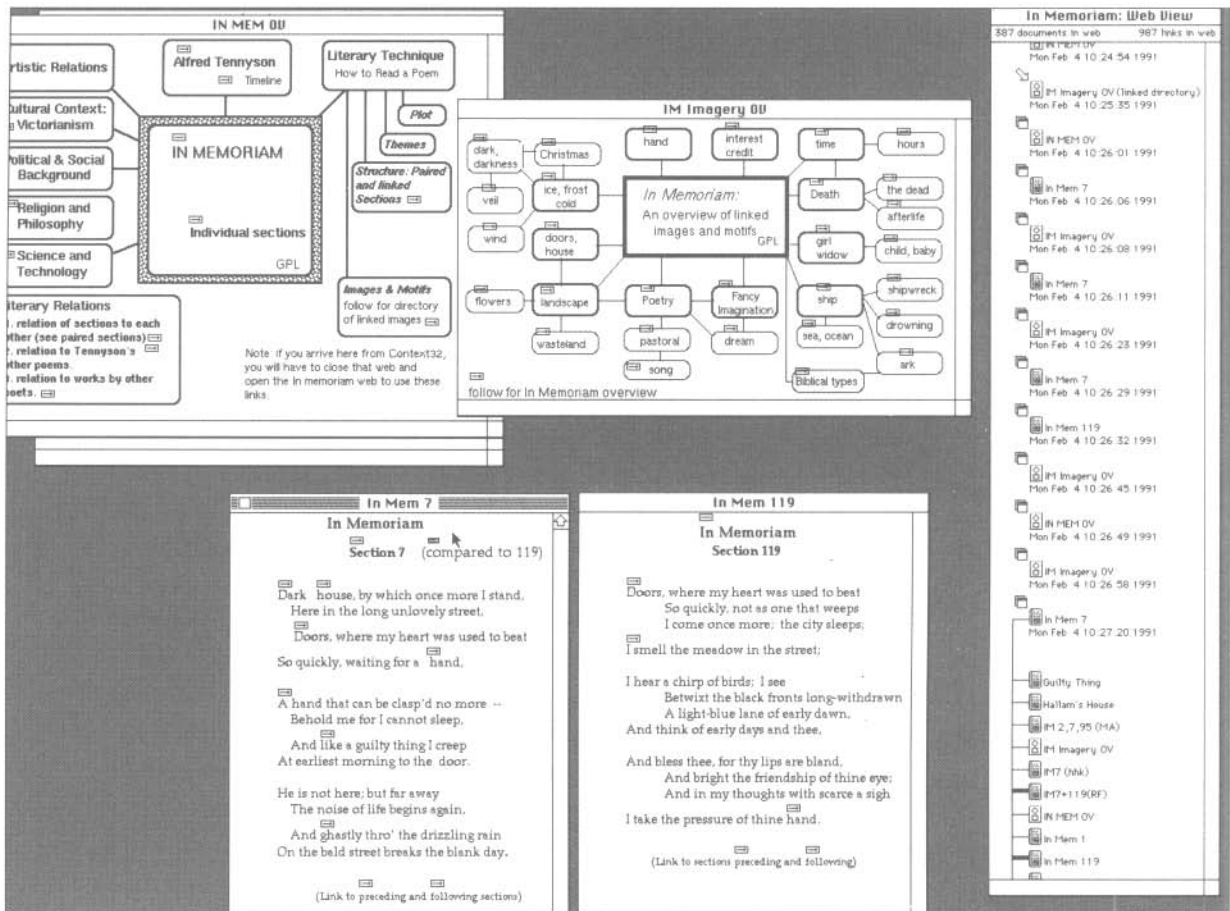
Figure 8. The Original Intermedia Version of *The In Memoriam Web*. In this snapshot of a typical screen during a session on Intermedia, the active document, *In Memoriam*, section 7 ("In Mem 7"), appears at the lower left center of the screen with a darkened strip across its top to indicate its status. Using the capacities of hypertext to navigate the poem easily, a reader has juxtaposed sections 119 and 7, which echo and complete each other. *In Memoriam* overview (IN MEM OV), which appears at the upper left, is a graphic document that serves as a sitemap: it organizes linked materials under generalized headings, such as "Cultural Context: Victorianism," or "Images and Motifs." The *In Memoriam* imagery overview ("IM Imagery OV"), a second visual index document, overlies the right border for the entire poem. On the right appears the Web View, which the system automatically creates for each document as the document becomes active either by being opened, or, if it is already open on the desktop, by being clicked on. In contrast to the hierarchically organized overviews the author creates, the Web View shows titled icons representing all documents connected electronically to the active document, here section 7 of the poem. Touching any link marker with the arrow-shaped cursor darkens the icons representing the documents linked to it; in this case, the reader has darkened the marker above the phrase "compared to 119" and thereby darkened icons representing both the text of section 7 and a student essay comparing it to section 119.
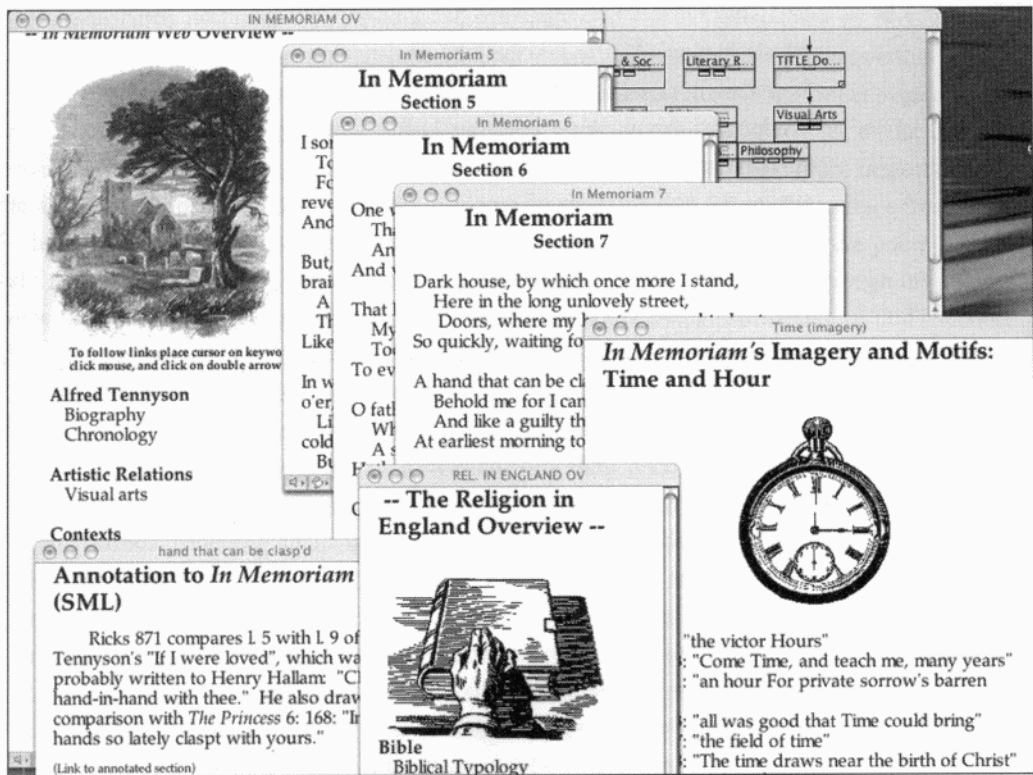
Figure 9. The Storyspace Version of *The In Memoriam Web*. Readers can make their way through this body of interlinked documents in a number of ways. One can proceed by following links from principal overviews, such as that for the entire web (*at left*), religion in England (*lower right*), or individual motifs—in this case that for time (*middle right*). One can also explore the folderlike structure of the Storyspace view (*upper right*), which can contain a dozen or more layers, or one can follow links from individual sections of the poem. This screen shot indicates how multiwindow hypertext systems, such as Storyspace, Intermedia, and Multicosm, enable authors to fix the location of windows, thereby permitting one to arrange the screen in ways that help orient the reader. Readers can easily move between parts of the poem and commentary on it.

Tennyson's radically experimental *In Memoriam* provides an exemplification of the truth of Benjamin's remark that "the history of every art form shows critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard, that is, to say, in a new art form" (*Illuminations*, 237). Another manifestation of this principle appears in Victorian word-painting, particularly in the hands of Ruskin and Tennyson, which anticipates in abundant detail the techniques of cinematography. Whereas word-painting anticipates a future medium (cinema)

by using narrative to structure description, *In Memoriam* anticipates electronic hypertextuality precisely by challenging narrative and literary form based on it. Convinced that the thrust of elegiac narrative, which drives the reader and the mourner relentlessly from grief to consolation, falsified his own experiences, the poet constructed a poem of 131 fragments to communicate the ebb and flow of emotion, particularly the way the aftershocks of grief irrationally intrude long after the mourner has supposedly recovered.

Arthur Henry Hallam's death in 1833 forced Tennyson to question his faith in nature, God, and poetry. *In Memoriam* reveals that Tennyson, who found that brief lyrics best embodied the transitory emotions that buffeted him after his loss, rejected conventional elegy and narrative because both presented the reader with a too unified—and hence too simplified—version of the experiences of grief and acceptance. Creating an antilinear poetry of fragments, Tennyson leads the reader of *In Memoriam* from grief and despair through doubt to hope and faith; but at each step stubborn, contrary emotions intrude, and one encounters doubt in the midst of faith and pain in the midst of resolution. Instead of the elegiac plot of "Lycidas," "Adonais," and "Thyrsis," *In Memoriam* offers fragments interlaced by dozens of images and motifs and informed by an equal number of minor and major resolutions, the most famous of which is section 95's representation of Tennyson's climactic, if wonderfully ambiguous, mystical experience of contact with Hallam's spirit. In addition, individual sections, like 7 and 119 or 28, 78, and 104, variously resonate with one another.

The protohypertextuality of *In Memoriam* atomizes and disperses Tennyson the man. He is to be found nowhere, except possibly in the epilogue, which appears after and outside the poem itself. Tennyson, the real, once-existing man, with his actual beliefs and fears, cannot be extrapolated from within the poem's individual sections, for each presents Tennyson only at a particular moment. Traversing these individual sections, the reader experiences a somewhat idealized version of Tennyson's moments of grief and recovery. *In Memoriam* thus fulfills Paul Valéry's definition of poetry as a machine that reproduces an emotion. It also fulfills another of Benjamin's observations, one he makes in the course of contrasting painter and cameraman: "The painter maintains in his work a natural distance from reality, the cameraman penetrates deeply into its web. There is a tremendous difference between the pictures they obtain. That of the painter is a total one, that of the cameraman consists of multiple fragments which are assembled under a new law" (*Illuminations*, 233–34). Although speaking of a different information medium, Benjamin here captures some sense of the way hypertext,

when compared to print, appears atomized; and in doing so, he also conveys one of the chief qualities of Tennyson's antilinear, multisequential poem.

The *In Memoriam* web attempts to capture the nonlinear organization of the poem by linking sections, such as 7 and 119, 2 and 39, or the Christmas poems, which echo across the poem to one another. More important, using the capacities of hypertext, the web permits the reader to trace from section to section several dozen leitmotifs that thread through the poem. Working with section 7, for example, readers who wish to move through the poem following a linear sequence can do so by using links to previous and succeeding sections, but they can also look up any word in a linked electronic dictionary or follow links to variant readings, critical commentary (including a comparison of this section and 119), and discussions of the poem's intertextual relations. Furthermore, activating indicated links near the words *dark, house, doors, hand,* and *guilty* produces a choice of several kinds of materials. Choosing *hand* instantly generates a menu that lists all the links to that word, and these include a graphic directory of *In Memoriam*'s major images, critical commentary on the image of the hand, and, most important, a concordance-like list of each use of the word in the poem and the phrase in which it appears; choosing any one item in the list produces the linked document, the graphic overview of imagery, a critical comment, or the full text of the section in which a particular use of hand appears.

Using the capacities of Intermedia and Storyspace to join an indefinite number of links to any passage (or block) of text, the reader moves through the poem along many different axes. Although, like the previously mentioned hypertext materials, the *In Memoriam* web contains reference materials and variant readings, its major difference appears in its use of link paths that permit the reader to organize the poem by means of its network of leitmotifs and echoing sections. In addition, this hypertext presentation of Tennyson's poem also contains a heavily linked graphic overview of the poem's literary relations—its intertextual relations, sources, analogues, confluences, and influences—that permits one to read the poem along axes provided by sets of links relating to the Bible and to works by thirty-eight other writers, chiefly poets, including Vergil, Horace, Dante, Chaucer, Shakespeare, and Milton as well as the Romantics and Victorians. Although Lanestedt, various students, and I created these links, they represent a form of objective links that could have been created automatically by a full-text search in systems such as Microcosm. Here, as in other respects, this web represents an adaptive form of hypertext.

In contrast to adapting texts whose printed versions already divide into

sections analogous to lexias, one may, in the manner of Barthes's treatment of "Sarrasine" in *S/Z*, impose one's own divisions on a work. Obvious examples of possible projects of this sort include hypertext versions of either "Sarrasine" alone or of it and Barthes's *S/Z*. Stuart Moulthrop's version of *Forking Paths: An Interaction after Jorge Luis Borges* (1987) adapts Borges's "Forking Paths" in an electronic version that activates much of the work's potential for variation (see Moulthrop, "Reading from the Map"). Other fiction that obviously calls for translation into hypertext includes Julio Cortázar's *Hopscotch* and Robert Coover's "The Babysitter."

These instances of adaptive hypertext all exemplify forms of transition between textuality and hypertextuality. In addition, works originally conceived for hypertext already exist as well. These webs electronically link blocks of text, that is, lexias, to one another and to various graphic supplements, such as illustrations, maps, diagrams, and visual directories and overviews, some of which are foreign to print technology. In the future there will be more metatexts formed by linking individual sections of individual works, although the notion of an individual, discrete work becomes increasingly undermined and untenable within this form of information technology, as it already has within much contemporary critical theory. Such materials include hypertextual poetry and fiction, which I shall discuss later in this volume, and the already abundant World Wide Web equivalents of scholarly and critical work in print.

One of the first such works in this new medium—certainly the first on Intermedia—was Barry J. Fishman's "The Works of Graham Swift: A Hypertext Thesis," a 1989 Brown University honors thesis on the contemporary British novelist. Fishman's thesis takes the form of sixty-two lexias, of which fifty-five are text documents and seven diagrams or digitized photographs. The fifty-five text documents he created, which range from one-half to three single-space pages in length, include discussions of Swift's six published book-length works, the reviews each received, correspondence with the novelist, and essays on themes, techniques, and intertextual relations of both each individual book and Swift's entire oeuvre up to 1989. Although Fishman created his hypermedia corpus as a relatively self-contained set of documents, he linked his materials to several dozen documents already present on the system, including materials by faculty members in at least three different departments and comments by other students. Since Fishman created his web, it has grown as many other students added their own lexias, and it moved first to Storyspace and, more recently, to the World Wide Web, where it constitutes an important part of a web containing materials on recent Anglophone postcolonial and postimperial literature.

New Forms of Discursive Prose—Academic Writing and Weblogs

I have been describing new kinds of discursive prose, for at the very least hypertext enables new forms of the academic essay, book review, and thesis. More than a decade's work by thousands of scholars using the Internet has shown that these academic genres can take three basic forms. At their simplest, the author simply places a text without links into an HTML template that includes navigation links. As Peter Brusilovsky and Riccardo Rizzo have pointed out in a prize-winning conference paper, a great deal of current academic writing for the Web follows this model, which does not take advantage of the possibilities of hypertext.

In a second kind of hypertext prose, the author creates a document with links to documents on the same as well as on other websites. In essence this means, as I urge my students, that we must write with an awareness that we are writing in the presence of other texts. These other texts may support or contradict our argument, or some of them may serve as valuable annotations to it. For example, my review in *The Victorian Web* of Joseph Bizup's *Manufacturing Culture: Vindications of Early Victorian Industry* (2003) contains more than a dozen links to on-site materials about authors, novels, and historical events. In contrast, a review of Dale H. Porter's *The Thames Embankment: Environment, Technology, and Society in Victorian London* (1998) contains few links to existing lexias but more than a dozen to brief sample passages from Porter's book on topics including Oxford in 1850, the invention of urban green spaces, civil engineering as a profession, and Victorian wages for skilled and unskilled labor. In addition to making links to these brief lexias from the main text, I also appended a list of them plus a few others at the end of the review. Links to Porter's materials were also added to the sitemaps for science, technology, social history, and economics. Both author and publisher were delighted with this approach to reviewing because they believed, correctly, that it spread word about Porter's work in a particularly effective way.

The third kind of hypertext essay, as we have seen from Fishman's honors thesis, takes the form of a set of networked documents, created either to stand alone, as it largely was, or to take part in a larger web. Either way, an author wanting to conceive of an argument in terms of networked documents can write a concise essay to which she or he links a wide range of supporting evidence. Readers can then choose what areas they want to investigate in greater depth, and these auxiliary materials thereby become paratexts, easily accessible add-ons to the lexia one is currently reading.

The Weblog, or blog, as it is commonly known, is another new kind of discursive prose in digital form that makes us rethink a genre that originally

arose when writing took the form of physical marks on physical surfaces. Blogging, the latest Internet craze, has major importance for anyone interested in hypertext because one form of it provides the first widely available means on the Web of allowing the active reader-author envisaged by Nelson, van Dam, and other pioneers. Blogs take the form of an online journal or diary most commonly written by a single person, and, like paper journals and diaries, they present the author's words in dated segments. Unlike their paper predecessors, they present entries in reverse chronological order. They can employ two different forms of hypertextuality. First, unlike discussion lists, all bloggers can link chronologically distant individual entries to each other, thereby "allowing readers to put events in context and get the whole story without the diarist having to explain again" (McNeill, 30). The second form of hypertextuality occurs only in those blogger systems that permit readers to comment on entries. Here's how it works: encountering a comment on my son's blog about the legality of China's revoking the patent for Viagra, I clicked on the word "Comment" and thereby opened a form into which I pasted my remarks plus a few sentences from Vincent Mosco's historical account of nineteenth-century American information piracy (which I use in chapter 8, below). Before I could submit it, the form containing my comment requested three bits of information: my e-mail address (required), my name ("real is appreciated"), and the URL of my website, if any (optional). Returning to the blog, I discovered that the zero next to "comment" had changed to "1." Clicking on the word "comment" opened a document containing what I had just submitted plus a space for other people to add their responses to my comment. There are more than a dozen kinds of blogging software, and many, including b2Evolution, Moveable Type, and Serendipity, have the Trackback feature that also allows bloggers to post links back to the site of anyone who commented on them.

Visually, blogs take many forms, but most have several columns, the widest dedicated to the dated entries and one or more others containing links to archives of older entries, personal information, associated blogs, and major topics of interest to the person who owns the site. Many contain images and even video, and most contain a personal statement or description of the site, which may be very brief, such as "i stash things here so i can find them again. sometimes other people come visit. or so the tracker implies." Some bloggers maintain two or more sites, one devoted to their academic or professional interests and another to their personal diary. Many users prefer reading blogs of friends and family members to e-mail, because they have no spam, and for that and other reasons they have become enormously popular. Many sophis-

ticated bloggers use special software to subscribe to their favorite sites, thereby ensuring that they know when something new is posted on them. RSS and Atom feed represent the two main standards for such subscription tools. Whereas RSS sends the subscriber only the headline of a new blog, Atom feed adds a summary and includes its links as well. So-called feed readers obtain, organize, and display materials from large numbers of websites and Weblogs.

Blogs themselves can take as many forms and have as many principal organizing ideas as other forms of websites, but the majority of bloggers (and also the most intense ones) are highly skilled computer users whose professional activities demand technical information. According to www.technorati.com, which claims to have watched 3,145,522 Weblogs (entries) and tracked 456,140,934 links, Slashdot, a famous multiuser techie site, proved most popular, with 12, 904 blogs and 21,041 links. Fark, another popular blog that claims to have received over 350 million pageviews in 2003, offers a digest of the news. Each entry takes the form of a one-line summary that links to sources accompanied by little icons containing comments, such as "amusing," "cool," "obvious," "scary," and "stupid." An example of this last category on July 17, 2004: "Martha Stewart compares herself to Nelson Mandela," which links to its source, CNN. This item provoked ninety-two comments that stated almost every possible opinion about the criminal case.

NGOs and other organizations dealing with economic and political issues have blogs, as well as those concentrating on specific diseases, such as AIDS, asthma, tuberculosis, and cancer. Disease blogs take two very different forms, the first created by organizations that work toward the prevention and cure of a particular illness, the second written by people suffering from the disease; some of their intensely personal online diaries have acquired large followings. On a lighter note, many hobbies or leisure activities, such as model railroading and gardening, have blogs, though I found very few for hunting or flying; I did discover an Australian one, though, on fear of flying. Perhaps the most extreme personal-interest blogs involve sexual fetishes, including one by a nonsmoker who finds pictures of women smoking in public erotic.

Phil Gyford's translation of Samuel Pepys's famous seventeenth-century diary into a Weblog, which exemplifies the way ingenious people find unexpected uses for computer genres, creates a new form of participatory scholarship. As Gyford explained in an interview available in the online version of BBC News (World Edition), "I thought Pepys' diary could make a great Weblog. The published diary takes the form of nine hefty volumes—a daunting prospect. Reading it day by day on a website would be far more manageable, with the real-time aspect making it a more involving experience." As I am writing this

on July 22, 2004, I find Pepys's diary entry for July 21, 1661, which has been up at least since the 19th, since a comment on the place name "Sturtloe" by Mark Ynys-Mon points out that it has changed to "Stirtloe," and a second submitted the next day by Vincente points out that "Sam on his nag could have had a nice ride down by the Ouse" and provides a link to a map of the area. Gyford has tried to ensure that most of the annotations are helpful by advising contributors: "Before posting an annotation please read the annotation guidelines. If your comment isn't directly relevant to this page, or is more conversational, try the discussion group." This blog, which contains approximately two hundred words, has thirteen in-text links, one by Gyford himself (a cross-reference to another *Diary* entry) and others leading to one or more readers' comments. The entry for July 21, 1661, dominates the screen, though if one scrolls down one can find entries back to the 13th. At the top of the window, Gyford has provided links to an introduction to the *Diary*, background information, archives, and a summary ("Read the Story So Far") for first-time readers. At the top right a search window appears and below it a column of links to seventeen categories of background information starting with art and literature, including food and drink, and ending with work and education. As this brief description makes clear, Gyford has not only made an appropriate Web translation of a classic text but he has also contributed importantly to the creation of a new form of public, collaborative online scholarship. Two interesting points: (1) Gyford's name does not appear on the main lexias of the blog, though if one explores "About this site," one can find it, and following a link to his personal site, one can learn about his fascinating career as an art student, professional model maker, system administrator, and web designer. (2) This elaborate scholarly project, which one expects that any Web-savvy undergraduate and graduate student will use, exists completely *outside* the Academy. Pause for a moment and think about the implications of that.

Many special-interest blogs, like some famous ones by AIDS and cancer victims, exemplify the Internet version of the personal journal or diary. Laurie McNeill's excellent article on the blog as personal diary (about which I learned from Adrian Miles's blog) points to "an unparalleled explosion of public life writing by private citizens. By March 2002, more than 800,000 blogs were registered on the Net; in July 2002 an average of 1.5 'Blogger blogs' were created *per minute* (blogger.com 6 Aug. 2002)" (32). When I checked two years later, some hosts of blogs boasted millions of users, estimates of the total ranging between two and eight million, though one commentator pointed out that only a quarter of people who begin blogs keep them going.

Googling the phrase "how many bloggers," I received the URLs for several

sites with some of the information for which I was looking, but among the top entries appeared one from the blog of a young woman enumerating her sexual experiences (I hadn't meant that "how many"!). Her entry, which appeared as a separate lexia, contained links to another blog with similar material, and when I clicked on the link in the original blog labeled "Home," I found a site whose contents reminded me of the HBO television show, "Sex and the City"— more for the comedy, though, than the sex. Although the blogger identifies herself only as "Blaise K. ," she includes enough personal information, including photographs and the assertion that she is black and Jewish, that her anonymity doesn't seem very well protected. I assume the blogger intends the site for her friends, but Google mistakenly brought me there, as it may well bring her parents and employers. It is very difficult to maintain this kind of public privacy.

McNeill points out that such sites "often reinforce the stereotype of the diary as a genre for unbridled narcissism" because they assume that other people care about what bloggers have to say. That narcissism, McNeill admits, often turns out be justified, for some online diaries receive thousands of visitors and make their authors famous. They also place the author's remarks about private matters in a very public space. In fact, one of the most interesting effects of blogging lies in the way it unsettles our accustomed borders between the private and public spheres. "In their immediacy and accessibility, in their seemingly unmediated state, Web diaries blur the distinction between online and offline lives, 'virtual reality' and 'real life,' 'public' and 'private,' and most intriguingly for auto/biography studies, between the life and the text" (McNeill, 25). Those blogs that accept comments allow, McNeill claims, the "reader of an online diary" to participate actively

in constructing the text the diarist writes, and the identities he or she takes on in the narrative. Though active and even intimate, however, that participation remains virtual, disembodied. The confessor stays behind the "grille" of the Internet, allowing the diarist—and the reader—the illusion of anonymity necessary for "full" self-exposure. Janet Murray notes that "some people put things on their home page . . . that they have not told their closest friends. The enchantment of the computer creates for us a public space that also feels very private and intimate" (99) . . . For the online diarist, having readers means that the diarist has both joined and created communities, acts that inform the texts he or she will produce. (27, 32)

Many bloggers don't in fact allow comments, or else they screen them, and some intend their online diaries solely for a circle of friends and control access to them by using passwords. Nonetheless, once an entry goes online,

Internet search tools can bring it to the attention of Web surfers. The edges of a blog, like the borders of any document on the Internet, are porous and provisional at best. Most of the time when we consider the way digital media blur the borders of documents, we mean that links and search tools limit the power of authorship. In blogs we encounter a new prose genre that also unsettles our long-standing assumptions about public and private.

Problems with Terminology:

What Is the Object We Read, and

What Is a Text in Hypertext?

Writing about hypertext in a print medium immediately produces terminological problems much like those Barthes, Derrida, and others encountered when trying to describe a textuality neither instantiated by the physical object of the printed book nor limited to it. Since hypertext radically changes the experiences that *reading, writing,* and *text* signify, how, without misleading, can one employ these terms, so burdened with the assumptions of print technology, when referring to electronic materials? We still read *according to* print technology, and we still direct almost all of what we write toward print modes of publication, but we can already glimpse the first appearances of hypertextuality and begin to ascertain some aspects of its possible futures. Terms so implicated with print technology necessarily confuse unless handled with great care. Two examples will suffice.

An instance of the kind of problem we face appears when we try to decide what to call the object at which or with which one reads. The object with which one reads the production of print technology is, of course, the book, or smaller print-bearing forms, such as the newspaper or instruction sheet; for the sake of simplicity I shall refer to "book" as the most complex instance of printing technology. In our culture the term *book* can refer to three very different entities—the object itself, the text, or the instantiation of a particular technology. Calling the machine one uses to read hypertext an "electronic book," however, would be misleading, since the machine at which one reads (and writes, and carries out other operations, including sending and receiving mail) does not itself constitute a book, a text: it does not coincide either with the virtual text or with a physical embodiment of it.

Additional problems arise when one considers that hypertext involves a more active reader, one who not only chooses her reading paths but also has the opportunity (in true read-write systems) of reading as someone who creates text; that is, at any time the person reading can assume an authorial role and either attach links or add text to the text being read. Therefore, a term like *reader,* such as some computer systems employ for their electronic mailboxes or message spaces, does not seem appropriate either.[3]

One earlier solution was to call this reading-and-writing site a worksta-tion by analogy to the engineer's workstation, the term assigned to a relatively high-powered machine, often networked with others, that in the early 1990s had far more computing power, memory, and graphic capacities than the per-sonal computer. However, because *workstation* seems to suggest that such objects exist only in the workplace and find application only for gainful labor or employment, this choice of terminology also misleads. Nonetheless, I shall employ it occasionally, if only because it seems closer to what hypertext demands than any of the other terms thus far suggested. The problem with terminology arises, as has now become obvious, because the roles of reader and author change so much in hypermedia technology that our current vocabulary does not have much appropriate to offer.

Whatever one wishes to call the reading-and-writing site, one should think of the actual mechanism that one will use to work (and play) in hyper-text not as a free-standing machine, like today's personal computer. Rather, the "object one reads" must be seen as the entrance, the magic doorway, into the docuverse, since it is the individual reader's and writer's means of partic-ipating in—of being linked to—the world of linked hypermedia documents.

A similar terminological problem appears in what to do with the term *text*, which I have already employed so many times thus far in this study. More than any other term crucial to this discussion, *text* has ceased to inhabit a single world. Existing in two very different worlds, it gathers contradictory meanings to itself, and one must find some way of avoiding confusion when using it. Frequently, in trying to explain certain points of difference, I have found myself forced to blur old and new definitions or have discovered my-self using the old term in an essentially anachronistic sense. For example, in discussing that hypertext systems permit one to link a passage "in" the "text" to other passages "in" the "text" as well as to those "outside" it, one confronts precisely such anachronism. The kind of text that permits one to write, how-ever incorrectly, of insides and outsides belongs to print, whereas we are here considering a form of electronic virtual textuality for which these already sus-pect terms have become even more problematic and misleading. One solu-tion has been to use *text* as an anachronistic shorthand for the bracketed material in the following expression: "If one were to transfer a [complete printed] text (work), say, Milton's *Paradise Lost*, into electronic form, one could link passages within [what had been] the [original] text (Milton's poem) to each other; and one could also link passages to a wide range of materials out-side the original text to it." The problem is, of course, that as soon as one con-verts the printed text to an electronic one, it no longer possesses the same

kind of textuality. In the following pages such references to text have to be understood, therefore, to mean "the electronic version of a printed text."

The question of what to call "text" in the medium of hypermedia leads directly to the question of what to include under that rubric in the first place. This question in turn immediately forces us to recognize that hypertext reconfigures the text in a fundamental way not immediately suggested by the fact of linking. Hypertextuality, like all digital textuality, inevitably includes a far higher percentage of nonverbal information than does print; the comparative ease with which such material can be appended encourages its inclusion. Hypertext, in other words, to some degree implements Derrida's call for a new form of hieroglyphic writing that can avoid some of the problems implicit and therefore inevitable in Western writing systems and their printed versions. Derrida argues for the inclusion of visual elements in writing as a means of escaping the constraints of linearity. Commenting on this thrust in Derrida's argument, Gregory Ulmer explains that grammatology thereby "confronts" four millennia during which anything in language that "resisted linearization was suppressed. Briefly stated, this suppression amounts to the denial of the pluridimensional character of symbolic thought originally present in the 'mythogram' (Leroi-Gourhan's term), or nonlinear writing (pictographic and rebus writing)" (*Applied Grammatology*, 8). Derrida, who asks for a new pictographic writing as a way out of logocentrism, has to some extent had his requests answered in hypertext. N. Katherine Hayles argues that digital text alone, even without links, emphasizes the visual, because "the computer restores and heightens the sense of word as image—an image drawn in a medium as fluid and changeable as water" (26).

Because hypertext systems link together passages of verbal text with images as easily as they link two or more passages of text, hypertext includes hypermedia, and I therefore use the two terms interchangeably. Moreover, since computing digitizes both alphanumeric symbols and images, electronic text in theory easily integrates the two. In practice, popular word-processing programs, such as Microsoft Word, have increasingly featured the capacity to include graphic materials in text documents, and, as we shall see, this capacity to insert still and moving images into alphanumeric text is one of the characterizing features of HTML. Linking, which permits an author to send the reader to an image from many different portions of the text, makes such integration of visual and verbal information even easier.

In addition to expanding the quantity and diversity of alphabetic and nonverbal information included in the text, computer text provides visual elements not found in printed work. Perhaps the most basic of these is the cur-

sor, the blinking arrow, line, or other graphic element that represents the reader-author's presence in the text. The cursor, which the user moves either from the keypad by pressing arrow-marked keys or with devices like a mouse, rollerball, or trackpad, provides a moving intrusive image of the reader's presence in the text. Holding the mouse over a footnote number in Microsoft Word produces the text in the note in a pop-up window. The reader can also change the text by using the mouse to position the cursor between the letters in a word, say, between *t* and *h* in *the*. Pressing a button on the mouse inserts a vertical blinking line at this point; pressing the backspace or delete key removes the *t*. Typing will insert characters at this point. In a book one can always move one's finger or pencil across the printed page, but one's intrusion always remains physically separate from the text. One may make a mark on the page, but one's intrusion does not affect the text itself.

The cursor, which adds reader presence, activity, and movement, combines in most previous and extant hypertext systems with another graphic element, a symbol that indicates the presence of linked material.[4] The World Wide Web offers several kinds of changing cursors: the cursor changes from an arrow to a hand when positioned over a linked word or image, and commonly used Java scripts change the appearance of linked objects upon mouse-over—when, that is, the user positions the mouse over them. Yet other scripts produce drop-down menus of links. All these graphic devices remind readers that they are processing and manipulating a new kind of text, in which graphic elements play an important part.

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Visual Elements in Print Text

This description of visual elements of all computer text reminds one that print also employs more visual information than people usually take into account: visual information is not limited, as one might at first think, merely to the obvious instances, such as illustrations, maps, diagrams, flow charts, or graphs.[5] Even printed text without explicitly visual supplementary materials already contains a good bit of visual information in addition to alphanumeric code. The visual components of writing and print technology include spacing between words, paragraphing, changes of type style and font size, formatting to indicate passages quoted from other works, assigning specific locations on the individual page or at the end of sections or of the entire document to indicate reference materials (foot notes and endnotes).

Despite the considerable presence of visual elements in print text, they tend to go unnoticed when contemporary writers contemplate the nature of text in an electronic age. Like other forms of change, the expansion of writ-

ing from a system of verbal language to one that centrally involves nonverbal information—visual information in the form of symbols and representational elements as well as other forms of information, including sound—has encountered stiff resistance, often from those from whom one is least likely to expect it, namely, from those who already employ computers for writing. Even those who advocate a change frequently find the experience of advocacy and change so tiring that they resist the next stage, even if it appears implicit in changes they have themselves advocated.

This resistance appears particularly clearly in the frequently encountered remark that writers should not concern themselves with typesetting or desktop publishing but ought to leave those activities to the printer. Academics and other writers, we are told, do not design well; and even if they did, the argument continues, such activities are a waste of their time. Such advice, which has recently become an injunction, should make us ask why. After all, when told that one should not avail oneself of some aspect or form of empowerment, particularly as a writer, one should ask why. What if someone told us: "Here is a pencil. Although it has a rubber apparatus at the opposite end from that with which you write, you should not use it. Real writers don't use it"? At the very least we should wonder why anyone had included such capacities to do something; experimenting with it would show that it erases; and very likely, given human curiosity and perversity, which may be the same thing in certain circumstances, we would be tempted to try it out. Thus a capacity would evolve into a guilty pleasure!

Anyone with the slightest interest in design who has even casually surveyed the output of commercial and university presses has noticed a high percentage of appallingly designed or obviously undesigned books. Despite the exemplary work of designers like P. J. Conkwright, Richard Eckersley, and Glen Burris, many presses continue to produce nasty-looking books with narrow margins and gutters, type too small or too coarse for a particular layout, and little sense of page design. Financial constraints are usually offered as the sole determinant of the situation, though good design does not have to produce a more costly final product, particularly in an age of computer typesetting. In several cases I am aware of, publishers have assigned book design to beginning manuscript editors who have had no training or experience in graphic design. As one who has been fortunate enough to have benefited from the efforts of first-rate, talented designers far more than I have suffered from those of poor ones, I make these observations not as a complaint but as a preparation for inquiring why authors are told they should not concern

themselves with the visual appearance of their texts and why authors readily accept such instruction.

They do so in part because this injunction clearly involves matters of status and power. In particular, it involves a certain interpretation—that is, a social construction—of the idea of writer and writing. According to this conception, the writer's role and function is just to write. Writing, in turn, is conceived solely as a matter of recording (or creating) ideas by means of language. On the surface, such an approach seems neutral and obvious enough, and that in itself should warn one that it has been so naturalized as to include cultural assumptions that might be worth one's while to examine.

The injunction "just to write," which is based on this purely verbal conception of writing, obviously assumes the following: first, that only verbal information has value, at least for the writer as a writer and probably for the reader as reader;[6] second, that visual information has less value. Making use of such devalued or lesser-valued forms of information (or does visual material deserve the description "real information" at all?) in some way reduces the status of the writer, making him or her less of a real writer. This matter of status again raises its head when one considers another reason for the injunction "just to write," one tied more tightly to conceptions of division of labor, class, and status. In this view of things, it is thought that authors should not concern themselves with matters that belong to the printer. Although troubled by this exclusion, I accepted this argument until I learned that until recently (say, in the 1930s) authors routinely wandered around the typesetting shop at Oxford University Press while their books were being set and were permitted to render advice and judgment, something we are now told is none of our business, beneath us, and so on. The ostensible reason for instructing authors to refuse the power offered them by their writing implement also includes the idea that authors do not have the expertise, the sheer know-how to produce good design. Abundant papers by beginning undergraduates and beginning PC users, cluttered with dissonant typefaces and font sizes, used to be thrust forward to support this argument, one that we receive too readily without additional information. Now people point to ugly websites and blogs.

The fact that beginners in any field of endeavor do a fairly poor quality job at a new activity hardly argues forcefully for their abandoning that activity. If it did, we would similarly advise beginning students immediately to abandon their attempts at creative and discursive writing, at drawing and philosophy, and at mathematics and chemistry. One reason we do not offer such instructions is because we feel the skills involved in those endeavors are impor-

tant—apparently in contrast to visual ones. Another reason, of course, is that teaching involves our livelihood and status. The question that arises, then, is why is visual information less important? The very fact that people experiment with visual elements of text on their computers shows the obvious pleasure they receive in manipulating visual effects. This pleasure suggests in turn that by forbidding the writer visual resources, we deny an apparently innocent source of pleasure, something that apparently must be cast aside if one is to be a true writer and a correct reader.

Much of our prejudice against the inclusion of visual information in text derives from print technology. Looking at the history of writing, one sees that it has a long connection with visual information, not least the origin of many alphabetic systems in hieroglyphics and other originally visual forms of writing. Medieval manuscripts present some sort of hypertext combination of font sizes, marginalia, illustrations, and visual embellishment, both in the form of calligraphy and that of pictorial additions.

This same prejudice against visual elements appears in recent supposedly authoritative guidelines for creating websites. Jakob Nielsen's *Designing Web Usability,* for example, advises web designers to avoid graphic elements, particularly for opening screens (homepages), because they unnecessarily consume both bandwidth and screen real estate. I certainly understand the reasons for such advice. Like many other users in the early days of commercial sites, I've waited many minutes for the opening screen of a national airline's site to download even though I had high-speed network access, finally giving up. Early web designers found themselves so understandably enthralled by elaborate graphics and animation that they cluttered sites with nonfunctional elements that consumed important resources. As the airline website shows, this approach proved disastrous for commercial applications at a time when most potential customers had slow Internet connections. Obviously, designers must balance ease of access against visual elements that encourage people to access the site in the first place, but avoiding graphic elements as a basic design principle doesn't make much sense for one obvious reason: images and other graphic elements are the single most important factor in the astonishing growth of the Word Wide Web. The invention of the image tag (<img src="picture.jpg">), which instructs the web browser to place a picture, icon, or other graphic element within text, made the World Wide Web immensely appealing, turning it into a medium rich with visual pleasures. The embed tag, which places QuicktimeVR, sound, and video in an HTML document, similarly converts the Web to a multimedia platform. Therefore, whether or not we believe it has an identifiable logic—a McLuhan-esque mes-

sage in the medium—the Web certainly is significantly pictorial. Recommending that one should not use static or moving images in a medium popularized by their very presence therefore seems particularly bizarre.[7]

This blindness to the crucial visual components of textuality not only threatens to hinder our attempts to learn how to write in electronic space but has also markedly distorted our understanding of earlier forms of writing. In particular, our habits of assuming that alphanumeric—linguistic—text is the only text that counts has led to often bizarre distortions in scholarly editing. As Jerome J. McGann reminds us in *The Textual Condition*, "literary works typically secure their effects by other than purely linguistic means" (77), always deploying various visual devices to do so. Hence leaving such aspects of the text out of consideration—or omitting them from scholarly editions—drastically reconfigures individual works. "All poetry, even in its most traditional forms, asks the reader to decipher the text in spatial as well as linear terms. Stanzaic and generic forms, rhyme schemes, metrical orders: all of these deploy spatial functions in scripted texts, as their roots in oral poetry's 'visual' arts of memory should remind us" (113). One cannot translate such nonprint and even antiprint works like that of Blake and Dickinson into print without radically reconfiguring them, without creating essentially new texts, texts a large portion of whose resources have been excised. Although "textual and editorial theory has heretofore concerned itself almost exclusively with the linguistic codes," McGann urges, "the time has come, however, when we have to take greater theoretical account of the other coding network which operates at the documentary and bibliographical level of literary works" (78). Once again, as with the scholarly editing of medieval manuscripts and nineteenth-century books, digital word and digital image provide lenses through which we can examine the preconceptions—the blinders—of what Michael Joyce calls "the late age of print" (*Of Two Minds,* 111).

Animated Text

The essential visual components of all text find perhaps their fullest instantiation in the form of animated text—text that moves, even dances, on the computer screen, sweeping from one side to the other, appearing to move closer to readers or retreat away from them into a simulated distance. Text animation, which has become very popular in recent digital poetry, derives from the nature of computer text, which takes the form of code. Until the development of digital textuality, all writing necessarily took the form of physical marks on physical surfaces. With computers, writing, which had always been physical, now became a matter of codes—codes that could be changed, manipulated, and moved in entirely

new ways. "Change the code, change the text" became the rule from which derive the advantages of so-called word processing (which is actually the composition, manipulation, and formatting of text in computer environments). The advantages of word processing over typewriters became so immediately obvious themselves in business and academia that dedicated word processors and then personal computers swiftly made typewriters obsolete. "Change the code, change the text" also produces the "styles" option in word-processing software, such as Microsoft Word, which permits a writer to create and deploy styles containing font, type size, and rules for various text entities (paragraph, inset quotation, bibliography, and so on). By simply highlighting a word, sentence, or paragraph, the user of such software can easily modify the appearance of text, whether it is intended to remain on screen or issue forth as a printout or as a typeset book.

The same text-as-code that permits word processing also permits moving words. In its simplest form, text animation simply involves moving the text on screen a line at a time, essentially dispensing the poem at a rate determined by the author. Kate Pullinger and Talan Memmot's elegant *Branded* (2003; Figure 10) functions in this way. Pearl Forss's *Authorship* (2000), which combines sound and text animation, exemplifies the use of this kind of animated text to create experimental discursive writing for e-space. First, to the accompaniment of a driving drumbeat, the words "What is" appear in white block letters against a black screen to which are quickly added in the red-orange words "an author?" The question mark then dances on screen, after which the sentence moves downward as words of Roland Barthes on authorship move on screen; these in turn are replaced by Forss's pronouncements about authorship; then in green appear the words "what matters who's speaking?"—a question immediately identified as having been asked by Beckett (whose name, in white, undulates on screen). Next, an image of a rose fills the entire screen, and on top of it appear many pink letters, which soon arrange themselves to state, "A rose by any other name would smell as sweet," an assertion immediately challenged by the question (in green) "or would it?" And this screen is rapidly obliterated by the appearance of images of theorists on authorship and covers of their books, all of which build to a collage. What I've described makes up the opening section or movement, several of which follow, each punctuated by the same assembling collage.

Such text animation, often accompanied by sound, appears more frequently in digital literary art than in discursive or informational projects. For example, several of the animated poems on the *Dotze Sentits: Poesia catalona d'avui* CD-ROM (1996), such as Josep Palau i Fabre's "La Noia" and Feliu For-

A prisoner
is alone in his cell.

He stares at the ceiling.

His eyes are open.

Outside his cell,
there is a tremendous amount of noise –

He lies on his bed.
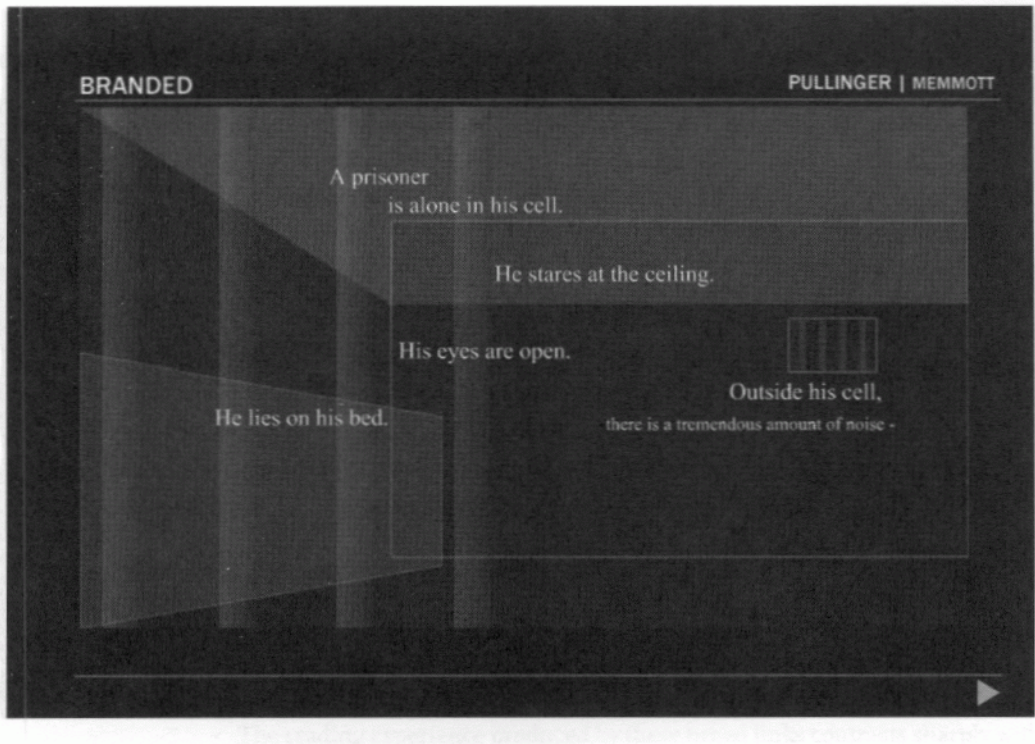
Figure 10. Animated Text. In Kate Pullinger and Talan Memmot's elegant animated poem, *Branded,* text animation takes the form of moving the text on screen a line at a time, dispensing the poem at a rate determined by the authors.

mosa's "Ell sort de seta l'aigua," accompany the sound of the poet's reading by moving words and phrases of different sizes and colors across the screen from top to bottom and from one edge of the screen to another; words pop in and out of existence, too, as the text performs itself.[8] More radical experimentation with animated text appears in Philadelpho Menezes and Wilton Azvedo's *Interpoesia: Poesia Hipmedia Interativa* (1998), in which elements (or fragments) of both spoken and written words react to the reader's manipulation of the computer mouse. Letters move, parts of words change color or disappear, and sounds become layered upon one another as the reader essentially performs the text using the sounds provided.

Moving text on screen, which has only become possible for most users with the advent of inexpensive computing power and broad bandwidth, has had an effect on digital literary arts almost as dramatic as that of word processing on academic institutions and the workplace. But are such projects hypertextual (and does it matter)?

Figure 11. Stephanie Strickland's *Vniverse*. Both a constellation and poetic text appear against the starry sky as the reader manipulates the mouse.

In one important sense, these projects, like *Branded,* appear essentially *anti*hypertextual. If one takes hypertext to be an information technology that demands readers take an active role, then these animated texts enforce the opposite tendency. In contrast to hypertext, they demand the reader assume a generally passive role as a member of an audience, rather than someone who has some say in what is to be read. They add, in other words, to the power of the author—or at least to the power of the text—and deny the possibility of a more empowered reader. Strickland's *Vniverse* represents a comparatively rare example of text-animation hypermedia that strives to grant readers control; it is, however, quite unusual (Figure 11).

If one were to arrange print text, hypertext, video, and animated text along a spectrum, hypertext, perhaps surprisingly, would take its place closest to print. Reading written or printed text, one cannot change its order and progression, but because the text is fixed on the page, one can leave it, reading another text, taking notes, or simply organizing one's thoughts, and

return to find the text where one left it, unchanged. The characteristic fixity of writing, therefore, endows the reader with the ability to process it asynchronously—that is, at the convenience of the reader.[9] Consider the difference of such fixed text from video and animated text: if one leaves the television set to answer the phone or welcome a guest, the program has moved on and one cannot retrieve it, unless, that is, one has a digital or analogue copy of it and can replay it. The very great difference in degree of audience control between video as seen on broadcast television and video viewed from storage media, such as videotape, DVD, or TiVo, suggests that they are experienced as different media. Still, since video, like cinema, is a temporal form—a technology that presents its information in necessary sequence—one generally has to follow long patches of the story or program in its original sequence to find one's place in an interrupted narrative. Animated text, in contrast, *entirely* controls the reader's access to information at the speed and at the time the author wishes. One could, it is true, replay the entire animated text, but the nature of the medium demands that the minimum chunk that can be examined takes the form of the entire sequence.

Another form of moving text appears in the timed links of Stuart Moulthrop's *Hegirascope,* links that dramatically affect the reader's relation to text. The reading experience produced by these timed links contrasts sharply with that possible with writing, print, and most hypertext. Since the text disappears at timed intervals outside the reader's control, the characteristic fixity of writing disappears as the document being read is replaced by another. Some of the replacements happen so quickly that this text enforces rapid reading, preventing any close reading, much less leisurely contemplation of it. Michael Joyce famously asserted that "hypertext is the revenge of text upon television" (*Of Two Minds,* 47, 111), by which I take him to mean that hypertext demands active readers in contrast to television's relatively passive audience. These examples of animated (or disappearing) text in contrast appear to be extensions of television and film to encompass and dominate text, or in Joyce's terms, the revenge of television (broadcast media) on hypertext. This is not necessarily a bad thing, any more than cinema is worse than print narrative. Animated text, like cinema and video, exists as an art form with its own criteria. It's just not hypertext.

Stretchtext

Not all animated alphanumeric text, it turns out, is nonhypertextual. In fact, Ted Nelson's stretchtext, which he advances as a complement to the by-now standard node-and-link form, produces a truly reader-activated form.[10] Except for researchers working with spatial hypertext, most students of hypermedia, like all users of the Web,

work on the assumption that it must take the form of node and link. A good deal of theoretical and practical attention has appropriately been paid to the description, implementation, and categorization of linking. However, as Noah Wardop-Fruin has reminded us, Ted Nelson, who did not confine hypertext to the node-and-link form, also proposed stretchtext. According to Nelson's *Computer Lib/Dream Machines* (1974), "this form of hypertext is easy to use without getting lost . . . Gaps appear between phrases; new words and phrases pop into the gaps, an item at a time . . . The Stretchtext is stored as a text stream with extras, coded to pop in and pop out at the desired altitudes" (315).

Compare a reader's experience of stretchtext to that when reading on the Web. When one follows a link on the World Wide Web, one of two things happens: either the present text disappears and is replaced by a new one or the destination text opens in a new window. (On Windows machines, in which the newly opened document obscures the previous one because it appears on top of it, only an experienced user would know that one can move the most recently opened window out of the way. Macintosh machines follow a different paradigm, emphasizing a multiple-window presentation.) By and large, standard web browsers follow the replacement paradigm whereas other hypertext environments, such as Intermedia, Storyspace, and Microcosm, emphasize multiple windows. Stretchtext, which takes a different approach to hypertextuality, does what its name suggests and stretches or expands text when the reader activates a hot area.

For an example, let us look at a single sentence as it appears in a document based on passages from this book that I made using Nicholas Friesner's Web-based stretchtext. One first encounters the following:

Using hypertext, students of critical theory now have a laboratory with which to test its ideas. Most important, perhaps, an experience of reading hypertext or reading with hypertext greatly clarifies many of the most significant ideas of **critical theory.** As J. David Bolter points out in the course of explaining that hypertextuality embodies poststructuralist conceptions of the open text, "what is unnatural in print becomes natural in the electronic medium and will soon no longer need saying at all, because it can be shown." (www.cyberartsweb.org/cpace/ht/stretchtext/gpl2.html)

Clicking on "**critical theory**" produces "**critical theory.** In fact, some of the most exciting **student projects** take the form of testing, applying, or critiquing specific points of theory, including notions of the **author, text, and multivocality.**" Next, clicking on "**student projects**" in turn produces "**student projects** in **Intermedia,** Storyspace, html, and Flash, and published examples of hypermedia take the form of testing, applying, or critiquing specific points of

theory, including notions of the **author, text,** and **multivocality**." Clicking on any of the four instances of bold text generates additional passages, the last three of which also contain a standard HTML link. Stretching "**text**," for example," produces "**text**—and Pearl Forss's *What Is an Author* acts as an experiment contrasting reader's reactions to moving text versus reader-centered hypertext." Clicking on the title of her project opens it in a new window.

A most important distinguishing characteristic of stretchtext follows from the manner in which it makes new text appear framed by the old: stretchtext does not fragment the text like other forms of hypermedia. Instead, it retains the text on the screen that provides a context to an anchor formed by a word or phrase even after it has been activated. Stretching the text provides a more immediate perceptual incorporation of the linked-to text with the text from which the link originates. In effect, *text* becomes *context* as new text is added; or rather, the previously present text remains while the new text appears and serves as its context. This conversion of text to context for other texts may be seen more abstractly in any textual medium, but stretchtext takes this notion quite literally.

The experience of using Friesner's Web-based implementation demonstrates that in certain situations stretchtext has an advantage over link-and-node hypertext; in other uses the link-and-node form works better. One strong advantage of stretchtext derives from the fact that hidden text is already present, though not visible, when the web browser loads the HTML file, and it therefore appears instantly when the text expands. The text also contracts instantly, thus providing two real advantages: first, because the newly appearing text appears in immediate physical proximity to the text one was reading before activating the stretchtext, the reader experiences none of the disorientation that may occur when following a link. Second, the very speed with which the stretchtext appears encourages readers to check stretchable areas to see if they in fact want the additional information on offer with the effect that readers feel they have more control over obtaining information.

Experience using stretchtext suggests that it provides a convenient means of obtaining definitions, brief explanations, and glossary-like annotations. In addition, a second or even third layer of stretchtext seems better suited than the replacement-window paradigm for more detailed information *directly related to the original anchor*. The one disadvantage the more clearly atomizing link-and-node hypertext does not have appears if one expands ancillary information—say, comments on Morris in an essay about Ruskin: reading a succession of increasingly more detailed stretchtext passages of the main topic can create reader disorientation when he or she returns to the passage's

original form by shrinking the text. Here the occasionally criticized atomizing effect of link-and-note hypertext in fact proves a major advantage because when readers follow a link, they know they have moved to someplace new. The gap that always plays an essential role in linked hypermedia here has an orienting, rather than a disorienting, effect. One obvious way to take advantage of both forms of hypertext, of course, involves including links to exterior lexias at appropriate points within the stretched text ("appropriate" here meaning those places at which further expansion of the original text makes returning to the original contracted text confusing).

Friesner's Web-based stretchtext also works well with images and hence proves itself to be a form of hypermedia that provides authors with new options. Web-based hypermedia has three main ways of incorporating images: (1) placing images at the end of the link whether they appear alone or within text containing explanatory information, (2) placing images within a Javascript-created pop-up window usually smaller than the document it overlays, and (3) placing thumbnail images within a text, often at the right or left margin, which can link to larger images (a simple use of align = "left" or "right" plus hspace = "10" within the image tag provides an easy way to allow text to flow around an image, providing an aesthetically pleasing border that separates them). stretchtext offers a fourth way to handle images, and like its purely text-based form, it has some particularly effective applications. A lexia chiefly devoted to discussing one painting most effectively includes the image of it as a linked thumbnail within the text, but passing mentions of details, sources, or analogous paintings work better as stretchtext presentations, for they are nonintrusive, quickly viewed, and quickly closed and left behind. Thus, stretchtext-image presentation seems particularly well suited for introducing images to which one may wish to refer briefly. Since one can nest images as well as alphanumeric information in Friesner's stretchtext, it also provides a convenient way for the reader to access details of painting, earlier versions, and so on.

When I first read about stretchtext I envisioned it functioning vertically, as it does so effectively in Friesner's version; that is, I assumed the text would move apart above and below the stretching section, although I did not imagine the text would appear instantaneously. When Ian M. Lyons created TextStretcher as a Director demonstration of the concept, he experimented with several approaches to make words appear from within an already present text. In one version the text moves horizontally, and as new words arrive, they push the old text to the right. In a second version the stretchable text divides vertically, leaving an empty area. In one of these implementations of

stretchtext, the words fill in from left to right until the space disappears; in another that Lyons considers especially useful for poetry, the first word of the new text appears in the center of the vacant area, and words then flow out from either side. If speed is calibrated with effective stops and starts, word-by-word presentation may give the impression of speech inscribed on the fly. Letter-by-letter presentation may then give the impression of the text's being typed out by either a human or an artificial source, depending on speed changes.

In linear stretch mode, activating the stretchtext anchor makes the sentence or phrase in which it appears divide, producing an empty space that new words begin to fill, moving from left to right. Once one begins animating the presentation of new text, a temporal delay occurs. As Lyons points out, this delay can perceptually create the impression of a certain amount of resistance the medium itself presents to the embodiment of the text. Just how much resistance is met in turn depends on the relative speed with which words and letters appear on the screen. With linear presentation (here presumed to be in the direction of normal reading), the potential for a different reading experience multiplies, depending on whether one presents text one word or one letter at a time. (Lyons chose to present one word at a time.)

In the expansion-from-center mode, Lyons explains,

Expansion and contraction move in two opposite directions at once. Again, if properly calibrated, the speed at which text appears to allow for reading at both ends simultaneously on the fly significantly heightens the feeling of contextual dependency. With expansion from the center of the new lexia, text moving backward works to complete the newly created hanging fragment that precedes the new insertion; text moving forward (in the normal direction of reading) aims to give reverse justification for the waiting text that now marks the latter half of the newly old, contextualizing material. Moreover, the cognitive experience of learning to read in multiple directions at once so as to realign severed context is at first rather challenging. What is exciting about this approach is that, from a cognitive standpoint, it creates an alternative reading procedure, one that while predictably difficult remains surprisingly possible. (Private communication)

This form of stretchtext, which Lyons created for writing poetry, obviously draws attention to the experience of text itself, intentionally preventing the reader from reading *through* the text, from too readily taking the text as transparent. With informational hypertext, however, one does not wish to foreground the linguistic aspect of the medium, and one therefore needs devices that enable reading.

Like all hypertext environments, TextStretcher needs a means of indicating to the reader the presence of an anchor, here defined as a span of text or other information that, when the proper protocol is followed, activates the hypertext functionality; in node-and-link hypertext such activation involves following a link; in stretchtext it involves inserting nested or hidden text within the present text. Different link-and-node systems have employed different ways of indicating hot text: Intermedia used static indications of links—a horizontal arrow within a rectangle at the end of a text span; the World Wide Web uses both static and dynamic means—the standard blue underlined text that authors and users can customize and the changing appearance of the user's mouse from an arrow to a hand when positioned over an anchor.

In creating TextStretcher, Lyons chose two simple symbols: (1) a vertical line within parentheses to indicate an anchor and (2) a hyphen between parentheses to indicate that one can contract the stretched text to produce its earlier state. When one clicks on an icon representing hot text in all versions of TextStretcher, new words appear, and depending on the icon, clicking again can either make the newly arrived text disappear or expand it further with new information. Friesner's Web-based stretchtext uses a boldface font to indicate an expandable anchor and a colored unboldface font to indicate contractible text. Some experimenting with his version have used phrases, such as "[Show/Hide Additional Content]" and icons, and others working with stretchtext combine a three- or four-inch gap followed by "More" on a colored rectangle. None of these approaches seems entirely satisfactory, and one possible solution might involve revealing the locations of stretchable text by mouse-overs. Stretchtext complements note-and-link hypermedia so valuably that solving these interface issues warrants considerable attention.

The Dispersed Text

At the same time that the individual hypertext lexia has looser, or less determining, bonds to other lexias from the same work (to use a terminology that now threatens to become obsolete), it also associates itself with text created by other authors. In fact, it associates with whatever text links to it, thereby dissolving notions of the intellectual separation of one text from others, just as some chemicals destroy the cell membrane of an organism. Destroying the cell membrane destroys the cell; it kills. In contrast, similarly destroying now-conventional notions of textual separation may destroy certain attitudes associated with text, but it will not necessarily destroy text. It will, however, reconfigure it and our expectations of it.

Another related effect of electronic linking is that it disperses "the" text

into other texts. As an individual lexia loses its physical and intellectual separation from others when linked electronically to them, it also finds itself dispersed into them. The necessary contextualization and intertextuality produced by situating individual reading units within a network of easily navigable pathways weaves texts, including those by different authors and those in nonverbal media, tightly together. One effect is to weaken and perhaps destroy any sense of textual uniqueness.

Such notions are hardly novel to contemporary literary theory, but here as in so many other cases hypertext creates an almost literal reification or embodiment of a principle that had seemed particularly abstract and difficult when read from the vantage point of print. Since much of the appeal, even charm, of these theoretical insights lies in their difficulty and even preciousness, this more literal presentation promises to disturb theoreticians, in part, of course, because it greatly disturbs status and power relations within their field of expertise.

Hypertextual Translation of Scribal Culture

Hypertext fragments, disperses, or atomizes text in two related ways. First, by removing the linearity of print, it frees the individual passages from one ordering principle—sequence—and threatens to transform the text into chaos. Second, hypertext destroys the notion of a fixed unitary text. Considering the "entire" text in relation to its component parts produces the first form of fragmentation; considering it in relation to its variant readings and versions produces the second.

Loss of a belief in unitary textuality could produce many changes in Western culture, many of them quite costly, when judged from the vantage point of our present print-based attitudes. Not all these changes are necessarily costly or damaging, however, particularly to the world of scholarship, where this conceptual change would permit us to redress some of the distortions of naturalizing print culture. Accustomed to the standard scholarly edition of canonical texts, we conventionally suppress the fact that such twentieth-century print versions of works originally created within a manuscript culture are bizarrely fictional idealizations that produce a vastly changed experience of text. To begin with, the printed scholarly edition of Plato, Vergil, or Augustine provides a text far easier to negotiate and decipher than any available to these authors' contemporary readers. They encountered texts so different from ours that even to suggest that we share common experiences of reading misleads.

Contemporary readers of Plato, Vergil, or Augustine processed texts without interword spacing, capitalization, or punctuation. Had you read these last two sentences fifteen hundred years ago, they would have taken the following form:

theyencounteredtextssodifferentfromoursthateventosuggestthatwesharecommon
experiencesofreadingmisleadscontemporaryreadersofplatovergiloraugustine
processedtextswithoutinterwordspacingcapitalizationorpunctuationhadyouread
theselasttwosentencesfifteenhundredyearsagotheywouldtakethefollowingform

Such unbroken streams of alphabetic characters made even phonetic literacy a matter of great skill. Since deciphering such texts heavily favored reading aloud, almost all readers experienced texts not only as an occasion for strenuous acts of code breaking but also as a kind of public performance.

The very fact that the text we would have read fifteen hundred years ago appeared in a manuscript form also implies that to read it in the first place we would first have had to gain access to a rare, even unique object—assuming, that is, that we could have discovered the existence of the manuscript and made an inconvenient, expensive, and often dangerous trip to see it. Having gained access to this manuscript, we would also have approached it much differently from the way we today approach the everyday encounter with a printed book. We would probably have taken the encounter as a rare, privileged opportunity, and we would also have approached the experience of reading this unique object with a very different set of assumptions than would a modern scholar. As Elizabeth Eisenstein has shown, the first role of the scholar in a manuscript culture was simply to preserve the text, which doubly threatened to degrade with each reading: each time someone physically handled the fragile object, it reduced its longevity, and each time someone copied the manuscript to preserve and transmit its text, the copyist inevitably introduced textual drift.

Thus, even without taking into account the alien presence of pagination, indices, references, title pages, and other devices of book technology, the encounter with and subsequent reading of a manuscript constituted a very different set of experiences than those which we take for granted. Equally important, whereas the importance of scholarly editions lies precisely in their appearance in comparatively large numbers, each manuscript of our texts by Plato, Vergil, or Augustine existed as a unique object. We do not know which particular version of a text by these authors any reader encountered. Presenting the history and relation of texts created within a manuscript cul-

ture in terms of the unitary text of modern scholarship certainly fictional-izes—and falsifies—their intertextual relations.

Modern scholarly editions and manuscripts combine both uniqueness and multiplicity, but they do so in different ways. A modern edition of Plato, Vergil, or Augustine begins by assuming the existence of a unique, unitary text, but it is produced in the first place because it can disseminate that text in a number of identical copies. In contrast, each ancient or medieval manu-script, which embodies only one of many potential variations of "a text," exists as a unique object. A new conception of text is needed by scholars try-ing to determine not some probably mythical and certainly long-lost master text but the ways individual readers actually encountered Plato, Vergil, or Augustine in a manuscript culture. In fact, we must abandon the notion of a unitary text and replace it with conceptions of a dispersed text. We must do, in other words, what some art historians working with analogous medieval problems have done—take the conception of a unique type embodied in a single object and replace it with a conception of a type as a complex set of vari-ants. For example, trying to determine the thematic, iconological, and com-positional antecedents of early-fourteenth-century ivory Madonnas, Robert Suckale and other recent students of the Court Style have abandoned linear derivations and the notion of a unitary type. Instead, they emphasize that sculptors chose among several sets of fundamental forms or "groundplans" as points of departure. Some sort of change in basic attitudes toward the cre-ations of manuscript culture seems necessary.

The capacity of hypertext to link all the versions or variants of a particu-lar text might offer a means of somewhat redressing the balance between uniqueness and variation in preprint texts. Of course, even in hypertext pre-sentations, both modern printing conventions and scholarly apparatus will still infringe on attempts to recreate the experience of encountering these texts, and nothing can restore the uniqueness and corollary aura of the indi-vidual manuscript. Nonetheless, as the work of Peter Robinson shows, hyper-text offers the possibility of presenting a text as a dispersed field of variants and not as a falsely unitary entity. High-resolution screens and other techno-logical capacities also increasingly permit a means of presenting all the indi-vidual manuscripts. The Bodleian Library, Oxford, has already put online detailed, large-scale images of some of its most precious illuminated manu-scripts. An acquaintance with hypertext systems might by itself sufficiently change assumptions about textuality to free students of preprint texts from some of their biases.

A Third Convergence: Hypertext and Theories of Scholarly Editing

All forms of hypertext, even the most rudimentary, change our conceptions of text and textuality. The dispersed textuality characteristic of this information technology therefore calls into question some of the most basic assumptions about the nature of text and scholarly textual editing. The appearance of the digital word has the major cultural effect of permitting us, for the first time in centuries, easily to perceive the degree to which we have become so accustomed to the qualities and cultural effects of the book that we unconsciously transfer them to the productions of oral and manuscript cultures. We so tend to take print and print-based culture for granted that, as the jargon has it, we have "naturalized" the book by assuming that habits of mind and manners of working associated with it have naturally and inevitably always existed. Eisenstein, McLuhan, Kernan, and other students of the cultural implications of print technology have demonstrated the ways in which the printed book formed and informed our intellectual history. They point out, for example, that a great part of these cultural effects derive from book technology's creation of multiple copies of essentially the same text. Multiple copies of a fixed text in turn produce scholarship and education as we know it by permitting readers in different times and places to consult and refer to the "same" text. Historians of print technology also point out that economic factors associated with book production led to the development of both copyright and related notions of creativity and originality. My reason for once again going over this familiar ground lies in the fact that all these factors combine to make a single, singular unitary text an almost unspoken cultural ideal. They provide, in other words, the cultural model and justification for scholarly textual editing as we have known it.

It is particularly ironic or simple poetic justice—take your pick—that digital technology so calls into question the assumptions of print-associated editorial theory that it forces us to reconceive editing texts originally produced for print as well as those created within earlier information regimes. Print technology's emphasis on the unitary text prompted the notion of a single perfect version of all texts at precisely the cultural moment that the presence of multiple print editions undercut that emphasis—something not much recognized, if at all, until the arrival of digitality. As the work of James Thorpe, George Bornstein, Jerome J. McGann, and others has urged, any publication during an author's lifetime that in some manner received his or her approval—if only to the extent that the author later chose not to correct changes made by an editor or printer—is an authentic edition. Looking at the works of authors such as Ruskin and Yeats, who radically rewrote and

rearranged their texts throughout their careers, one recognizes that the traditional scholarly edition generally makes extremely difficult reconstructing the version someone read at a particular date. Indeed, from one point of view it may radically distort our experience of an individual volume of poems by the very fact that it enforces an especially static frozen model on what turns out to have been a continually shifting and changing entity.

This new conception of a more fluid, dispersed text, possibly truer than conventional editions, raises the issue if one can have a scholarly edition at all, or if we must settle for what McGann terms an archive ("Complete Writings")—essentially a collection of textual fragments (or versions) from which we assemble, or have the computer assemble, any particular version that suits a certain reading strategy or scholarly question, such as "What version of *Modern Painters,* Volume 1, did William Morris read at a particular date and how did the text he read differ from what American Ruskinians read?"

One does not encounter many of these issues when producing print editions because matters of scale and economy decide or foreclose them in advance. In general, physical and economic limitations shape the nature of annotations one attaches to a print edition just as they shape the basic conception of that edition. So what can we expect to happen when these limitations disappear? Or, to phrase the question differently, what advantages and disadvantages, what new problems and new advantages, will we encounter with the digital word?

Hypertext, Scholarly Annotation, and the Electronic Scholarly Edition

One answer lies in what hypertext does to the concept of annotation. As I argue at length in the following chapter, this new information technology reconfigures not only our experience of textuality but also our conceptions of the author's relation to that text, for it inevitably produces several forms of asynchronous collaboration, the first, limited one inevitably appearing when readers choose their own ways through a branching text. A second form appears only in a fully networked hypertext environment that permits readers to add links to texts they encounter. In such environments, which are exemplified by the World Wide Web, the editor, like the author, inevitably loses a certain amount of power and control. Or, as one of my friends who created the first website for a major computer company pointed out, "If you want to play this game, you have to give up control of your own text." Although one could envision a situation in which any reader could comment on another editor's text, a far more interesting one arises when successive editors or commentators add to what in the print environment would

be an existing edition. In fact, one can envisage a situation in which readers might ultimately encounter a range of annotations.

An example taken from my recent experience with having students create an annotated version—read "edition"—of Carlyle's "Hudson's Statue" on the World Wide Web illuminates some of the issues here. I intended the assignment in part to introduce undergraduates to various electronic resources available at my university, including the online versions of the *Oxford English Dictionary* and *Encyclopaedia Britannica*. I wished to habituate them to using electronic reference tools accessible outside the physical precincts of the library both to acquaint them with these new tools and also to encourage students to move from them to those presently available only in print form. For this project students chose terms or phrases ranging from British political history ("Lord Ellenborough" and "People's League") to religion and myth ("Vishnu," "Vedas," "Loki"). They then defined or described the items chosen and then briefly explained Carlyle's allusion and, where known, his uses of these items in other writings.

This simple undergraduate assignment immediately raised issues crucial to the electronic scholarly edition. First of all, the absence of limitations on scale—or to be more accurate, the absence of the same limitations on scale one encounters with physical editions—permits much longer, more substantial notes than might seem suitable in a print edition. To some extent a hypertext environment always reconfigures the relative status of main text and subsidiary annotation. It also makes much longer notes possible. Electronic linking makes information in a note easily available, and therefore these more substantial notes conveniently link to many more places both inside and outside the particular text under consideration than would be either possible or conveniently usable in a print edition. Taking our present example of "Hudson's Statue," for instance, we see that historical materials on, say, democratic movements like Chartism and the People's International League, can shift positions in relation to the annotated text: unlike a print environment, an electronic one permits perceiving the relation of such materials in opposite manners. The historical materials can appear as annotations to the Carlyle text, or conversely "Hudson's Statue" can appear—be experienced as—an annotation to the historical materials. Both in other words exist in a networked textual field in which their relationship depends solely on the reader's need and purpose.

Such recognitions of what happens to the scholarly text in wide-area-networked environments, such as those created by World Wide Web and

HyperG, only complicates matters by forcing us to confront the question, "What becomes of the concept and practice of scholarly annotation?" Clearly, linking by itself isn't enough, and neither is text retrieval. At first glance, it might seem that one could solve many issues of scholarly annotation in an electronic environment by using sophisticated text retrieval. In the case of my student-created annotated edition of "Hudson's Statue," one could just provide instructions to use the available search tools, though this do-it-yourself approach would probably appeal only to the already-experienced researcher. Our textual experiment quickly turned up another, more basic problem when several bright, hard-working neophytes wrote elegant notes containing accurate, clearly attributed information that nonetheless referred to the wrong person, in two cases providing material about figures from the Renaissance rather than about the far-lesser-known nineteenth-century figures to whom Carlyle referred. What this simple-minded example suggests, of course, is nothing more radical than that for the foreseeable future scholarship will always be needed, or to phrase my point in terms relevant to the present inquiry, one cannot automate textual annotation. Text retrieval, however valuable, by itself can't do it all.

Fine, but what about hypertext? The problem, after all, with information retrieval lies in the fact that active readers might obtain either nonsignificant information or information whose value they might not be able to determine. Hypertext, in contrast, can provide editorially approved connections in the form of links, which can move from a passage in the so-called main text— here "Hudson's Statue"—to other passages in the same text, explanatory materials relevant to it, and so on. Therefore, assuming that one had permission to create links to the various online resources, such as the *OED*, one could do so. If one did not have such permission, one could easily download copies of the materials from them, choose relevant sections, and put them back online within a web to which one had access; this second procedure is in essence the one many students choose to follow. Although providing slightly more convenience to the reader than the text-retrieval do-it-yourself model, this model still confronts the reader with problems in the form of passages (or notes) longer than he or she may wish to read.

One solution lies in creating multilevel or linked progressive annotation. Looking at the valuable, if overly long, essay one student had written on Carlyle and Hindu deities, I realized that a better way of proceeding lay in taking the brief concluding section on Carlyle's satiric use of these materials and making that the first text or lexia the reader encounters; the first mention

of, say, Vedas or Vishnu, in that lexia was then linked to the longer essays, thereby providing conveniently accessible information on demand but not before it was required.

I have approached these questions about scholarly editions through the apparently unrelated matters of a student assignment and educational materials because they remind us that in anything like a fully linked electronic environment, all texts have variable applications and purposes. One consequence appears in the variable forms that annotation and editorial apparatus will almost certainly have to take: since everyone from the advanced scholar down to the beginning student or reader outside the setting of an educational institution might be able to read such texts, they will require various layers or levels of annotation, something particularly necessary when the ultimate linked text is not a scholarly note but another literary text.

Thus far I have written only as if the linked material in the hypertext scholarly edition consists of textual apparatus, explanatory comment, and contextualization, but by now it should have become obvious that many of those comments inevitably lead to other so-called primary texts. Thus, in our putative edition of "Hudson's Statue" one cannot only link it to reference works, such as the *OED*, the *Britannica*, (and possibly in the future) to the *Dictionary of National Biography*, but also to entire linguistic corpora and to other texts by the same author, including working drafts, letters, and other publications. Why stop there? Even in the relatively flat, primitive version of hypertext offered by the present World Wide Web of the Carlylean text demands links to works on which he draws, such as Jonathan Swift's *Tale of a Tub*, and those that draw on him, such as Ruskin's "Traffic," whose satiric image of the Goddess-of-Getting-on (or Britannia of the Market) derives rather obviously from Carlyle's ruminations on the never-completed statue of a stock swindler. Finally, one cannot restrict the text field to literary works, and "Hudson's Statue" inevitably links not only to the Bible and contemporary guides to its interpretation but also to a wide range of primary materials, including parliamentary documents and contemporary newspapers, to which Carlyle's text obviously relates.

Once again, though, linking, which reconfigures our experience and expectations of the text, is not enough, for the scholarly editor must decide *how* to link various texts. The need for some form of intermediary lexias again seems obvious, the first, say, briefly pointing to a proposed connection between two texts, the next in sequence providing a summary of complex relations (the outline, in fact, of what might in the print environment have been a scholarly article or even book), the third an overview of relevant com-

parisons, and the last the actual full text of the other author. At each stage (or lexia), the reader should have the power not only to return to the so-called main text of "Hudson's Statue" but also to reach these linked materials out of sequence. Vannevar Bush, who invented the general notion of hypertext, thought that chains or trails of links might themselves constitute a new form of scholarly writing, and annotations in the form of such guided tours might conceivably become part of the future scholarly edition. We can be certain, however, that as constraints of scale lessen, increasing amounts of material will be summoned to illuminate individual texts and new forms of multiple annotation will develop as a way of turning availability into accessibility.

Hypertext and the Problem of

Text Structure

The fact that a single lexia can function very differently within large networked hypertexts raises fundamental questions about the applicability of Standard Generalized Markup Language (SGML) and its heir, Extended Markup Language (XML), to electronic scholarly editions, which increasingly appear in vast electronic information spaces rather than in the stand-alone versions we see today in CD-ROMs, such as Peter Robinson's Chaucer project and Anne McDermott's edition of Johnson's *Dictionary*. The relation of markup languages and hypertext appears particularly crucial to scholarly editing since so many large projects depend on SGML, XML, and their more specific scholarly forms specified by the Text Encoding Initiative (TEI).

One of the fundamental strengths of XML, of course, lies in its creation of a single electronic text that can lend itself to many forms of both print and electronic presentation. Looking at medieval *scripta continua* above, we encountered text without any markup, not even spaces between words. Later manuscript and print text contains presentational markup—that is, the encoding takes the form of specific formatting decisions; one indicates a paragraph by skipping, say, an extra line and indenting five or seven spaces. Although perfectly suited to physical texts, such forms of encoding appear particularly inefficient and even harmful in electronic environments, since they prevent easy transference and manipulation of texts. So-called procedural markup characterizes handwritten and printed text; to indicate a paragraph, authors and scribes, as we have seen, follow a certain procedure, such as that described above. Electronic text works better when one creates a generalized markup that simply indicates the presence of a text entity, such as a paragraph, that is then defined in another place.

Once all aspects of any particular text have been indicated with the correct SGML and XML tags, the text appears in a wonderfully generalized, poten-

tially multiplicitous form. For example, after one has tagged (or "marked up") each instance of a text element, such as titles at the beginning of each chapter, by placing them between a particular set of tags—say, <chaptertitle> and </chaptertitle>—one can easily configure such text elements differently in different versions of a text. Thus, if printed on my university's mainframe printer, which permits only a single proportional font, chapter titles appear bolded in the larger of two available sizes. If printed with a typesetting device, however, the same chapter titles automatically appear in a very different font and size, say, 30-point Helvetica. If presented electronically, moreover, chapter titles can appear in a color different from that of the main text; in the DynaText translation of the version of *Hypertext,* for example, they appear in green whereas the main text appears in black. My first point here is that once one has created such a generalized text, one can adapt it to different publication modes with a single instruction that indicates the specific appearance of all labeled text elements. My second point here is that such tagged text records its own abstract structure.

In "What Is Text Really?," their pioneering essay on SGML, Stephen J. DeRose, David G. Durand, Elli Mylonas, and Allen H. Renear argue that text consists of hierarchically organized context objects, such as sentences, paragraphs, sections, and chapters. Do hypertext and markup languages, therefore, conceive of text in fundamentally opposed ways? At first glance, this seems to be the case, since hypertext produces nonhierarchical text structures whereas SGML and XML record hierarchical book structures. The question arises, To what extent do such visions of markup languages and hypertext conflict? After all, SGML and XML fundamentally assert book structure. But do they assert a single essential structure, however reconfigurable? Hypertext subverts hierarchy in text and in so doing might seem to subvert markup languages and call into question their basic usefulness. In electronic space, as we have already observed, an individual lexia may inhabit, or contribute to, several text structures simultaneously. At first consideration this fact might appear to suggest that markup languages fundamentally oppose hypertext, but such is hardly the case.

Once again, Ted Nelson provides assistance, for it is he who pointed out that the problem with classification systems lies in the fact not that they are bad but that different people—and the same person at different times—require different ones. One of the great strengths of hypertext, after all, lies in its ability to provide access to materials regardless of how they are classified and (hence) how and where they are stored. From the Nelsonian point of view, hypertext does not so much violate classifications as supplement them,

making up for their inevitable shortcomings. From the point of view of one considering either the relation of hypertext to markup languages or the hypertextualization of them, the problem becomes one of finding some way to encode or signal multiple structures or multiple classifications of structure. If a scholarly annotation and main text can exchange roles, status, and nature, then one needs a device that permits a SGML- or XML-marked lexia to present a different appearance, if so required, on being entered or opened from different locations.

Returning to our examples from "Hudson's Statue," we realize that readers starting from Carlyle's text will experience linked materials on Chartism and the People's League as annotations to it, but readers starting with primary or secondary materials concerning these political movements will experience "Hudson's Statue" as an annotation to them. When discussing writing for electronic space in chapter 5, I suggest ways in which both software designers and individual authors have to assist readers. For the moment I shall point out only that one such means of orienting and hence empowering readers takes the form of clearly indicating the permeable borders of the provisional text to which any lexia belongs. Using such orientation rhetoric might require that materials by Carlyle have a different appearance from those of conceivably related materials, such as lexias about the English Revolution of the 1640s and Victorian political movements. In such a case, one needs a way of configuring the text according to the means from which it is accessed. This textual polymorphism in turn suggests that in such environments text is alive, changing, kinetic, open-ended in a new way.

Argumentation, Organization, and Rhetoric

Electronic linking, which gives the reader a far more active role than is possible with books, has certain major effects. Considered from the vantage point of a literature intertwined with book technology, these effects appear harmful and dangerous, as indeed they must be to a cultural hegemony based, as ours is, on a different technology of cultural memory. In particular, the numerating linear rhetoric of "first, second, third" so well suited to print will continue to appear within individual blocks of text but cannot be used to structure arguments in a medium that encourages readers to choose different paths rather than follow a linear one. The shift away from linearization might seem a major change, and it is, but we should remind ourselves that it is not an abandonment of the natural.

"The structuring of books," Tom McArthur reminds us, "is anything but 'natural'—indeed, it is thoroughly unnatural and took all of 4,000 years to

bring about. The achievement of the Scholastics, pre-eminently among the world's scribal elites, was to conventionalize the themes, plot and shapes of books in a truly rigorous way, as they also structured syllabuses, scripture and debate" (69). Their conventions of book structure, however, changed fundamentally with the advent of the printing press, which encouraged alphabetic ordering, a procedure that had never before caught on. Why?

One reason must certainly be that people had already become accustomed over too many centuries to thematically ordered material. Such material bore a close resemblance to the "normal" organization of written work: . . . Alphabetization may also have been offensive to the global Scholastic view of things. It must have seemed a perverse, disjointed and ultimately meaningless way of ordering material to men who were interested in neat frames for containing all knowledge. Certainly, alphabetization poses problems of fragmentation that may be less immediately obvious with word lists but can become serious when dealing with subject lists. (76–77)

McArthur's salutary remarks, which remind us how we always naturalize the social constructions of our world, also suggest that from one point of view, the Scholastics', the movement from manuscript to print and then to hypertext appears one of increasing fragmentation. As long as a thematic or other culturally coherent means of ordering is available to the reader, the fragmentation of the hypertext document does not imply the kind of entropy that such fragmentation would have in the world of print. Capacities such as fulltext searching, automatic linking, agents, and conceptual filtering potentially have the power to retain the benefits of hypertextuality while insulating the reader from the ill effects of abandoning linearity.

Beginnings in the Open Text

The concepts (and experiences) of beginning and ending imply linearity. What happens to them in a form of textuality not governed chiefly by linearity? If we assume that hypertextuality possesses multiple sequences rather than that it has an entire absence of linearity and sequence, then one answer to this query must be that it provides multiple beginnings and endings rather than single ones. Theorists whose model of hypertext is the Word Wide Web might disagree with this claim. Marie-Laure Ryan, for example, asserts that "every hypertext has a fixed entry point—there must be an address to reach first before the system of links can be activated" (226). Although many web and other hyperfictions seem to support that statement, examples in various hypertext environments show that such is not the case. Joyce's *afternoon,* which was published in the Page Reader format, does have a fixed starting point, but other works

in Storyspace do not. Like most webfictions, *Patchwork Girl* has an opening screen, a drawing of Frankenstein's female monster that is equivalent to the frontispiece in a book, and it is followed by a second screen, which simultaneously serves as a title page and sitemap, presenting the reader with five points at which to begin reading: "a graveyard," "a journal," "a quilt," "a story," and "broken accents." Much, of course, depends on what Ryan intends by "system of links"; if one means the narrative, then her claim is not always true. If she means "that point of the hypertext that one sees first," then the claim is true but only in a trivial sense, because in those Storyspace hyperfictions that do not have an opening screen but present the reader with the software's graphic representation of folders and documents, the reader can choose any starting point in these spatial hypertexts. *Adam's Bookstore,* for example, which arranges its lexias in a circular pattern, invites readers to begin at any point. (Observation suggests most readers begin at the top center or top right.)

Similarly, even if we concentrate on webfiction—and Ryan's use of "address" suggests that she is thinking only about the Web, since a URL is an address—we encounter two ways in which readers do not enter narratives at a fixed point. First, search engines can guide readers to any lexia within a hyperfiction; authors of course do not intend such an apparently random starting point, but once they place their work on the Internet, they allow it to happen. (That is the reason I tell my students writing both hyperfiction and hypertext essays to be prepared for readers who "fall in through the living-room ceiling rather than entering through the front door," and therefore at least consider including navigation and orientation devices that will give readers some idea of where they have landed—and perhaps encourage them to keep reading.) Second, webfictions can also open, like *Patchwork Girl,* with a first screen that provides the reader with multiple beginnings. The opening screen, then, is no more the beginning of the narrative than are the title pages of *Jane Eyre* or *Waterland.*

Drawing on Edward W. Said's work on origins and openings, one can suggest that, in contrast to print, hypertext offers at least two different kinds of beginnings. The first concerns the individual lexia, the second a gathering of them into a metatext. Whenever one has a body of hypertext materials that stands alone—either because it occupies an entire system or because it exists, however transiently, within a frame, the reader has to begin reading at some point, and for the reader that point is a beginning. Writing of print, Said explains that "a work's beginning is, practically speaking, the main entrance to what it offers" (3). But what happens when a work offers many "main" entrances—in fact, offers as many entrances as there are linked passages by

means of which one can arrive at the individual lexia (which, from one perspective, becomes equivalent to a work)? Said provides materials for an answer when he argues that a "'beginning' is designated in order to indicate, clarify, or define a *later* time, place, or action. In short, the designation of a beginning generally involves also the designation of a consequent *intention*" (5). In Said's terms, therefore, even atomized text can make a beginning when the link site, or point of departure, assumes the role of the beginning of a chain or path. According to Said, "we see that the beginning is the first point (in time, space, or action) of an accomplishment or process that has duration and meaning. *The beginning, then, is the first step in the intentional production of meaning*" (5).

Said's quasi-hypertextual definition of a beginning here suggests that "in retrospect we can regard a beginning as the point at which, in a given work, the writer departs from all other works; a beginning immediately establishes relationships with works already existing, relationships of either continuity or antagonism or some mixture of both" (3).

Endings in the Open Text

If hypertext makes determining the beginning of a text difficult because it both changes our conception of text and permits readers to "begin" at many different points, it similarly changes the sense of an ending. Readers in read-write systems cannot only choose different points of ending, they can also continue to add to the text, to extend it, to make it more than it was when they began to read. As Nelson, one of the originators of hypertext, points out: "There is no Final Word. There can be no final version, no last thought. There is always a new view, a new idea, a reinterpretation. And literature, which we propose to electronify, is a system for preserving continuity in the face of this fact . . . Remember the analogy between text and water. Water flows freely, ice does not. The free-flowing, live documents on the network are subject to constant new use and linkage, and those new links continually become interactively available. Any detached copy someone keeps is frozen and dead, lacking access to the new linkage" (*Computer Lib*, 2/61, 48). Here, as in several other ways, Bakhtin's conception of textuality anticipates hypertext. Caryl Emerson, his translator and editor, explains that "for Bakhtin 'the whole' is not a finished entity; it is always a relationship . . . Thus, the whole can never be finalized and set aside; when a whole is realized, it is by definition already open to change" (*Problems*, xxxix).

Hypertext blurs the end boundaries of the metatext, and conventional notions of completion and a finished product do not apply to hypertext, whose essential novelty makes difficult defining and describing it in older

terms, since they derive from another educational and information technology and have hidden assumptions inappropriate to hypertext. Particularly inapplicable are the related notions of completion and a finished product. As Derrida recognizes, a form of textuality that goes beyond print "forces us to extend . . . the dominant notion of a 'text,'" so that it "is henceforth no longer a finished corpus of writing, some content enclosed in a book or its margins but a differential network, a fabric of traces referring endlessly to something other than itself, to other differential traces" ("Living On," 83–84).

Hypertextual materials, which by definition are open-ended, expandable, and incomplete, call such notions into question. If one put a work conventionally considered complete, such as *Ulysses,* into a hypertext format, it would immediately become "incomplete." Electronic linking, which emphasizes making connections, immediately expands a text by providing large numbers of points to which other texts can attach themselves. The fixity and physical isolation of book technology, which permits standardization and relatively easy reproduction, necessarily closes off such possibilities. Hypertext opens them up.

Boundaries of the Open Text

Hypertext redefines not only beginnings and endings of the text but also its borders—its sides, as it were. Hypertext thus provides us with a means to escape what Gérard Genette terms a "sort of idolatry, which is no less serious, and today more dangerous" than idealization of the author, "namely, the fetishism of the work—conceived of as a closed, complete, absolute object" (*Figures,* 147). When one moves from physical to virtual text, and from print to hypertext, boundaries blur— a blurring that Derrida works so hard to achieve in his print publications— and one therefore no longer can rely on conceptions or assumptions of inside and out. As Derrida explains, "To keep the outside out . . . is the inaugural gesture of 'logic' itself, of good 'sense' insofar as it accords with the self-identity of *that which is:* being is what it is, the outside is outside and the inside inside. Writing must thus return to being what it *should never have ceased to be:* an accessory, an accident, an excess" (*Dissemination,* 128). Without linearity and sharp bounds between inside and out, between absence and presence, and between self and other, philosophy will change. Working within the world of print, Derrida presciently argues, using Platonic texts as an example, that "the textual chain we must set back in place is thus no longer simply 'internal' to Plato's lexicon. But in going beyond the bounds of that lexicon, we are less interested in breaking through certain limits, with or without cause, than in putting in doubt the right to posit such limits in the

first place. In a word, we do not believe that there exists, in all rigor, a Platonic text, closed upon itself, complete with its inside and outside" (130).

Derrida furthermore explains, with a fine combination of patience and wit, that in noticing that texts really do not have insides and outsides, one does not reduce them to so much mush: "Not that one must then consider that it [the text] is leaking on all sides and can be drowned confusedly in the undifferentiated generality of the element. Rather, provided the articulations are rigorously and prudently recognized, one should simply be able to untangle the hidden forces of attraction linking a present word with an absent word in the text of Plato" (130).

Another sign of Derrida's awareness of the limitations and confinements of contemporary attitudes, which arise in association with the technology of the printed book, is his protohypertextual approach to textuality and meaning, an approach that remains skeptical of "a fundamental or totalizing principle," since it recognizes that "the classical system's 'outside' can no longer take the form of the sort of extra-text which would arrest the concatenation of writing" (5).

Hypertext both on the Internet and in its read-write forms thus creates an open, open-bordered text, a text that cannot shut out other texts and therefore embodies the Derridean text that blurs "all those boundaries that form the running border of what used to be called a text, of what we once thought this word could identify, i.e., the supposed end and beginning of a work, the unity of the corpus, the title, the margins, the signatures, the referential realm outside the frame, and so forth." Hypertext therefore undergoes what Derrida describes as "a sort of overrun [*débordement*] that spoils all these boundaries and divisions" ("Living On," 83). Anyone who believes Derrida is here being overly dramatic should consider the power of the open hypermedia systems discussed in chapter 1 to add links to someone else's Web document.

In hypertext systems, links within and without a text—intratextual and intertextual connections between points of text (including images)—become equivalent, thus bringing texts closer together and blurring the boundaries among them (Figure 12). Consider the case of intertextual links in Milton. Milton's various descriptions of himself as prophet or inspired poet in *Paradise Lost* and his citations of Genesis 3:15 provide obvious examples. Extra-textual and intratextual links, in contrast, are exemplified by links between a particular passage in which Milton mentions prophecy and his other writings in prose or poetry that make similar or obviously relevant points, as well as biblical texts, commentaries throughout the ages, comparable or contrasting

The Iliad

Invocations
in *Paradise Lost*

Book of Exodus

Wordsworth *'s*
Prelude
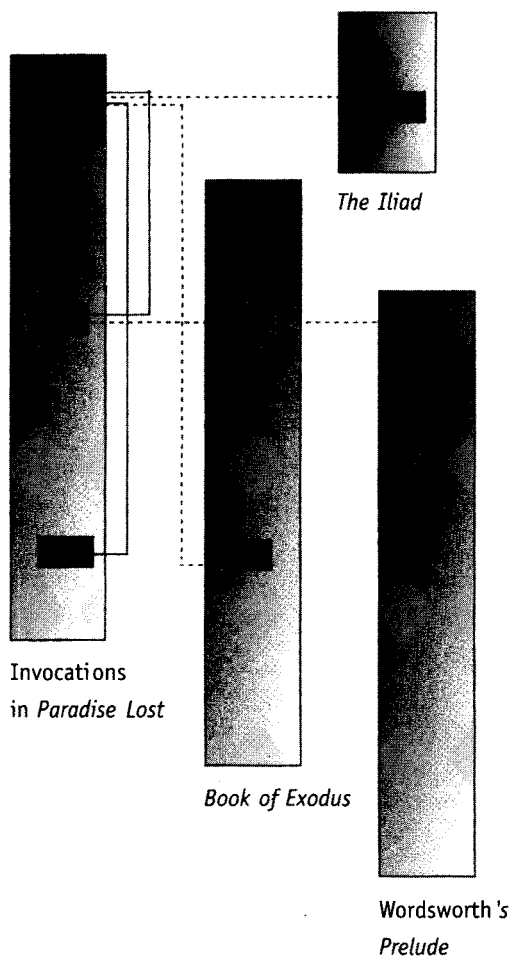
The Borderless Text

Linking changes the experience of text and authorship by rendering the borders of all text permeable:

By reifying allusions, echoes, references, and so on, linking

(1) makes them material,

(2) draws individual texts experientially closer together.

Consider, for example, a hypertext presentation (or "edition") of Milton's *Paradise Lost*.

Figure 12. The Borderless Electronic Text

poetic statements by others, and scholarly comment. Similarly, Miltonic citations of the biblical text about the heel of man crushing the serpent's head and being in turn bruised by the serpent obviously link to the biblical passage and its traditional interpretations as well as to other literary allusions and scholarly comment on all these subjects. Hypertext linking simply allows one to speed up the usual process of making connections while providing a means of graphing such transactions, if one can apply the word *simply* to such a radically transformative procedure.

The speed with which one can move between passages and points in sets of texts changes both the way we read and the way we write, just as the high-speed number-crunching computing changed various scientific fields by making possible investigations that before had required too much time or risk. One change comes from the fact that linking permits the reader to move with equal facility between points within a text and those outside it. Once one can move with equal facility between, say, the opening section of *Paradise Lost* and a passage in Book 12 thousands of lines "away," and between that opening section and a particular anterior French text or modern scholarly comment, then, in an important sense, the discreteness of texts, which print culture creates, has radically changed and possibly disappeared. One may argue that, in fact, all the hypertext linking of such texts does is embody the way one actually experiences texts in the act of reading; but if so, the act of reading has in some way gotten much closer to the electronic embodiment of text and in so doing has begun to change its nature.

These observations about hypertext suggest that computers bring us much closer to a culture some of whose qualities have more in common with that of preliterate man than even Walter J. Ong has been willing to admit. In *Orality and Literacy* he argues that computers have brought us into what he terms an age of "secondary orality" that has "striking resemblances" to the primary, preliterate orality "in its participatory mystique, its fostering of a communal sense, its concentration on the present moment, and even its use of formulas" (136). Nonetheless, although Ong finds interesting parallels between a computer culture and a purely oral one, he mistakenly insists: "The sequential processing and spatializing of the word, initiated by writing and raised to a new order of intensity by print, is further intensified by the computer, which maximizes commitment of the word to space and to (electronic) local motion and optimizes analytic sequentiality by making it virtually instantaneous" (136). In fact, hypertext systems, which insert every text into a web of relations, produce a very different effect, for they allow non- or multisequential reading and thinking.

One major effect of such nonsequential reading, the weakening of the boundaries of the text, can be thought of either as correcting the artificial isolation of a text from its contexts or as violating one of the chief qualities of the book. According to Ong, writing and printing produce the effect of discrete, self-contained utterance:

By isolating thought on a written surface, detached from any interlocutor, making utterance in this sense autonomous and indifferent to attack, writing presents utter-

ance and thought as uninvolved with all else, somehow self-contained, complete. Print in the same way situates utterance and thought on a surface disengaged from everything else, but it also goes farther in suggesting self-containment. (132)

We have already observed the way in which hypertext suggests integration rather than self-containment. Another possible result of such hypertext may also be disconcerting. As Ong points out, books, unlike their authors, cannot really be challenged:

The author might be challenged if only he or she could be reached, but the author cannot be reached in any book. There is no way to refute a text. After absolutely total and devastating refutation, it says exactly the same thing as before. This is one reason why "the book says" is popularly tantamount to "it is true." It is also one reason why books have been burnt. A text stating what the whole world knows is false will state falsehood forever, so long as the text exists. (79)

The question arises, however, If hypertext situates texts in a field of other texts, can any individual work that has been addressed by another still speak so forcefully? One can imagine hypertext presentations of books (or the equivalent) in which the reader can call up all the reviews and comments on that book, which would then inevitably exist as part of a complex dialogue rather than as the embodiment of a voice or thought that speaks unceasingly. Hypertext, which links one block of text to myriad others, destroys that physical isolation of the text, just as it also destroys the attitudes created by that isolation. Because hypertext systems permit a reader both to annotate an individual text and to link it to other, perhaps contradictory, texts, it destroys one of the most basic characteristics of the printed text—its separation and univocality. Whenever one places a text within a network of other texts, one forces it to exist as part of a complex dialogue. Hypertext linking, which tends to change the roles of author and reader, also changes the limits of the individual text.

Electronic linking radically changes the experience of a text by changing its spatial and temporal relation to other texts. Reading a hypertext version of Dickens's *Great Expectations* or Eliot's *Wasteland,* for example, one follows links to predecessor texts, variant readings, criticism, and so on. Following an electronic link to an image of, say, the desert or a wasteland in a poem by Tennyson, Browning, or Swinburne takes no more time than following one from a passage earlier in the poem to one near its end. Therefore, readers experience these other, earlier texts outside *The Wasteland* and the passage inside the work as existing equally distant from the first passage. Hypertext thereby

blurs the distinction between what is inside and what is outside a text. It also makes all the texts connected to a block of text collaborate with that text.

The Status of the Text, Status in the Text

Alvin Kernan claims that "Benjamin's general theory of the demystification of art through numerous reproductions explains precisely what happened when in the eighteenth century the printing press, with its logic of multiplicity, stripped the classical texts of the old literary order of their aura" (152), and it seems likely that hypertext will extend this process of demystification even further. Kernan convincingly argues that by Pope's time a "flood of books, in its accumulation both of different texts and identical copies of the same texts, threatened to obscure the few idealized classics, both ancient and modern, of polite letters, and to weaken their aura by making printed copies of them" (153). Any information medium that encourages rapid dissemination of texts and easy access to them will increasingly demystify individual texts. But hypertext has a second potentially demystifying effect: by making the borders of the text (now conceived as the individual lexia) permeable, it removes some of its independence and uniqueness.

Kernan further adds that "since printed books were for the most part in the vernacular, they further desacralized letters by expanding its canon from a group of venerable texts written in ancient languages known only to an elite to include a body of contemporary writing in the natural language understood by all who read" (153–54). Will electronic Web versions of the Bible accompanied by commentaries, concordances, and dictionaries, like *Nave's Topical Bible* (http://bible.christiansunite.com/Naves_Topical_Bible/), which seem to be essentially democratizing, similarly desacralize the scriptures? They have the potential to do so in two ways. First, by making some of the scholar's procedures easily available to almost any reader, this electronic Bible might demystify a text that possesses a talismanic power for many in its intended audience.

Second, and more fundamental, the very fact that this hypertext Bible enforces the presence of multiple versions potentially undercuts belief in the possibility of a unique, unitary text. Certainly, the precedent of Victorian loss of belief in the doctrine of verbal inspiration of the scriptures suggests that hypertext could have a potentially parallel effect (Landow, *Victorian Types*, 54–56). In Victorian England the widescale abandonment of belief that every word of the Bible was divinely inspired, even in its English translation, followed from a variety of causes, including influence of German higher criticism, independent British applications of rational approaches by those like

Bishop Colenso, and the discoveries of geology, philology, and (later) biology. The discovery, for instance, that Hebrew did not possess the uniqueness as a language that some believers, particularly Evangelicals, long assumed it did, eroded faith, in large part because believers became aware of unexpected multiplicity where they had assumed only unity. The discovery of multiple manuscripts of scripture had parallel effects. Hypertext, which emphasizes multiplicity, may cause similar crises in belief.

Although the fundamental drive of the printed page is a linear, straight-ahead thrust that captures readers and forces them to read along if they are to read at all, specialized forms of text have developed that use secondary codes to present information difficult or impossible to include in linear text. The footnote or endnote, which is one of the prime ways that books create an additional space, requires some code, such as a superscript number or one within parentheses, that signals readers to stop reading what is conventionally termed the *main* text or the body of the text and begin reading some peripheral or appended patch of text that hangs off that part of the main text.

In both scholarly editing and scholarly prose such divisions of text partake of fixed hierarchies of status and power. The smaller size type that presents footnote and endnote text, like the placement of that text away from the normal center of the reader's attention, makes clear that such language is subsidiary, dependent, less important. In scholarly editing, such typographic and other encoding makes clear that the editor's efforts, no matter how lavish or long suffering, are obviously less important than the words being edited, for these appear in the main text. That's why Barthes's *S/Z*, whose organization makes the reader encounter its many notes before coming to the text on which they comment, is both such a reconfiguration of conventional scholarly editions and an effective parody of them. In scholarly and critical discourse that employs annotation, these conventions also establish the importance of the dominant argument in opposition to the author's sources, scholarly allies, and opponents, and even the work of fiction or poetry on which the critical text focuses.

One experiences hypertext annotation of a text very differently. In the first place, electronic linking immediately destroys the simple binary opposition of text and note that founds the status relations that inhabit the printed book. Following a link can bring the reader to a later portion of the text or to a text to which the first one alludes. It may also lead to other works by the same author, or to a range of critical commentary, textual variants, and the like. The assignment of text and annotation to what Tom Wolfe calls different "statu-

spheres" therefore becomes very difficult, and in a fully networked environment such text hierarchies tend to collapse.

Hypertext linking situates the present text at the center of the textual universe, thus creating a new kind of hierarchy, in which the power of the center dominates that of the infinite periphery. But because in hypertext that center is always a transient, decenterable virtual center—one created, in other words, only by one's act of reading that particular text—it never tyrannizes other aspects of the network in the way a printed text does.

Barthes, well aware of the political constraints of a text that makes a reader read in a particular way, himself manipulates the political relations of text in interesting ways. The entire procedure or construction of S/Z, for example, serves as a commentary on the political relationships among portions of the standard scholarly text, the problem of hierarchy. Barthes playfully creates his own version of complex footnote systems. Like Derrida in *Glas,* he creates a work or metatext that the reader accustomed to reading books finds either abrasively different or, on rare occasion, a wittily powerful commentary on the way books work—that is, on the way they force readers to see relationships between sections and thereby endow certain assemblages of words with power and value because they appear in certain formats rather than others.

Barthes, in other words, comments on the footnote, and all of S/Z turns out to be a criticism of the power relations between portions of text. In a footnote or endnote, we recall, that portion of the text conventionally known as the main text has a value for both reader and writer that surpasses any of its supplementary portions, which include notes, prefaces, dedications, and so on, most of which take the form of apparatuses designed to aid information retrieval. These devices, almost all of which derive directly from print technology, can function only when one has fixed, repeatable, physically isolated texts. They have great advantages and permit certain kinds of reading: one need not, for example, memorize the location of a particular passage if one has system features such as chapter titles, tables of contents, and indices. So the reference device has enormous value as a means of reader orientation, navigation, and information retrieval.

It comes at certain costs, costs that, like most paid by the reader of text, have become so much a part of our experiences of reading that we do not notice them at all. Barthes makes us notice them. Barthes, like most late-twentieth-century critical theorists, is at his best seeing the invisible, breathing on it in hopes that the condensate will illuminate the shadows of what others have long missed and taken to be not there. What, then, does the footnote imply, and how does Barthes manipulate or avoid it? Combined with the

physical isolation of each text, the division between main text and footnote establishes the primary importance of main text in its relation to other texts even when thinking about the subject instantly reveals that such a relationship cannot in fact exist.

Take our scholarly article, the kind of articles we academics all write. One wishes to write an article on some aspect of the Nausicaa section of Joyce's *Ulysses*, a text that by even the crudest quantitative measures appears to be more important, more powerful than our note identifying, say, one of the sources of Gerty McDowell's phrasing from a contemporary women's magazine. Joyce's novel, for example, exists in more copies than our article can or will and it therefore has an enormously larger readership and reputation—all problematic notions, I admit, all relying on certain ideologies; and yet most of us, I expect, will accede to them for they are the values by which we work. Ostensibly, that is. Even deconstructionists privilege the text, the great work.

Once, however, one begins to write one's article, the conventions of print quickly call those assumptions into question, since anything in the main text is clearly more important than anything outside it. The physically isolated discrete text is very discreet indeed, for as Ong makes clear, it hides obvious connections of indebtedness and qualification. When one introduces other authors into the text, they appear as attenuated, often highly distorted shadows of themselves. Part of this is necessary, since one cannot, after all, reproduce an entire article or book by another author in one's own. Part of this attenuation comes from authorial inaccuracy, slovenliness, or outright dishonesty. Nonetheless, such attenuation is part of the message of print, an implication one cannot avoid, or at least one cannot avoid since the advent of hypertext, which by providing an alternative textual mode reveals differences that turn out to be, no longer, inevitabilities and invisibilities.

In print when I provide the page number of an indicated or cited passage from Joyce, or even include that passage in text or note, that passage—that occasion for my article—clearly exists in a subsidiary, comparatively minor position in relation to my words, which appear, after all, in the so-called main text. What would happen, though, if one wrote one's article in hypertext? Assuming one worked in a fully implemented hypertextual environment, one would begin by calling up Joyce's novel and, on one side of the video screen, opening the passage or passages involved. Next, one would write one's comment, but where one would usually cite Joyce, one now does so in a very different way. Now one creates an electronic link between one's own text and one or more sections of the Joycean text. At the same time one also links one's text to other aspects of one's own text, texts by others, and earlier

texts by oneself. Several things have happened, things that violate our expectations. First, attaching my commentary to a passage from Joyce makes it exist in a far different, far less powerful, relation to Joyce, the so-called original text, than it would in the world of physically isolated texts. Second, as soon as one attaches more than one text block or lexia to a single anchor (or block, or link marker), one destroys all possibility of the bipartite hierarchy of footnote and main text. In hypertext, the main text is that which one is presently reading. So one has a double revaluation: with the dissolution of this hierarchy, any attached text gains an importance it might not have had before.

In Bakhtin's terms, the scholarly article, which quotes or cites statements by others—"some for refutation and others for confirmation and supplementation—is one instance of a dialogic interrelationship among directly signifying discourses within the limits of a single context . . . This is not a clash of two ultimate semantic authorities, but rather an objectified (plotted) clash of two represented positions, subordinated wholly to the higher, ultimate authority of the author. The monologic context, under these circumstances, is neither broken nor weakened" (*Problems,* 188). Trying to evade the constraints, the logic, of print scholarship, Bakhtin himself takes an approach to quoting other authors more characteristic of hypertext or postbook technology than that of the book. According to his editor and translator, Emerson, when Bakhtin quotes other critics, "he does so at length, and lets each voice sound fully. He understands that the frame is always in the power of the framer, and that there is an outrageous privilege in the power to cite others. Thus Bakhtin's footnotes rarely serve to narrow down debate by discrediting totally, or (on the other hand) by conferring exclusive authority. They might identify, expand, illustrate, but they do not pull rank on the body of the text—and thus more in the nature of a marginal gloss than an authoritative footnote" (xxxvii).

Derrida also comments on the status relations that cut and divide texts, but unlike Barthes, he concerns himself with oppositions between preface and main text and main text and other texts. Recognizing that varying levels of status accrue to different portions of a text, Derrida examines the way each takes on associations with power or importance. In discussing Hegel's introduction to the *Logic,* Derrida points out, for example, that the preface must be distinguished from the introduction. They do not have the same function, or even the same dignity, in Hegel's eyes (*Dissemination,* 17). Derrida's new textuality, or true textuality (which I have continually likened to hypertextuality), represents "an entirely other typology where the outlines of the preface and the 'main' text are blurred" (39).

Hypertext and Decentrality: The Philosophical Grounding

One tends to think of text from within the position of the lexia under consideration. Accustomed to reading pages of print on paper, one tends to conceive of text from the vantage point of the reader experiencing that page or passage, and that portion of text assumes a centrality. Hypertext, however, makes such assumptions of centrality fundamentally problematic. In contrast, the linked text, the annotation, exists as the *other* text, and it leads to a conception (and experience) of text as Other.

In hypertext this annotation, or commentary, or appended text can be any linked text, and therefore the position of any lexia in hypertext resembles that of the Victorian sage. For like the sage, say, Carlyle, Thoreau, or Ruskin, the lexia stands outside, off center, and challenges. In other words, hypertext, like the sage, thrives on marginality. From that essential marginality to which he stakes his claim by his skillful, aggressive use of pronouns to oppose his interests and views to those of the reader, he defines his discursive position or vantage point.

Hypertext similarly emphasizes that the marginal has as much to offer as does the central, in part because hypertext refuses to grant centrality to anything, to any lexia, for more than the time a gaze rests on it. In hypertext, centrality, like beauty and relevance, resides in the mind of the beholder. Like Andy Warhol's modern person's fifteen minutes of fame, centrality in hypertext only exists as a matter of evanescence. As one might expect from an information medium that changes our relations to data, thoughts, and selves so dramatically, that evanescence of this (ever-migrating) centrality is merely a given—that's the way things are—rather than an occasion for complaint or satire. It is simply the condition under which—or within which—we think, communicate, or record these thoughts and communications in the hypertextual docuverse.

This hypertextual dissolution of centrality, which makes the medium such a potentially democratic one, also makes it a model of society of conversations in which no one conversation, no one discipline or ideology, dominates or founds the others. It is thus the instantiation of what Richard Rorty terms *edifying philosophy*, the point of which "is to keep the conversation going rather than to find objective truth." It is a form of philosophy

having sense only as a protest against attempts to close off conversation by proposals for universal commensuration through the hypostatization of some privileged set of descriptions. The danger which edifying discourse tries to avert is that some given vocabulary, some way in which people might come to think of themselves, will

deceive them into thinking that from now on all discourse could be, or should be, normal discourse. The resulting freezing-over of culture would be, in the eyes of edifying philosophers, the dehumanization of human beings. (377)

Hypertext, which has a built-in bias against "hypostatization" and probably against privileged descriptions as well, therefore embodies the approach to philosophy that Rorty urges. The basic experience of text, information, and control, which moves the boundary of power away from the author in the direction of the reader, models such a postmodern, antihierarchical medium of information, text, philosophy, and society.

4

Reconfiguring the Author

Erosion of the Self

Like contemporary critical theory, hypertext reconfigures—rewrites—the author in several obvious ways. First of all, the figure of the hypertext author approaches, even if it does not merge with, that of the reader; the functions of reader and writer become more deeply entwined with each other than ever before.[1] This transformation and near merging of roles is but the latest stage in the convergence of what had once been two very different activities. Although today we assume that anyone who reads can also write, historians of reading point out that for millennia many people capable of reading could not even sign their own names. Today when we consider reading and writing, we probably think of them as serial processes or as procedures carried out intermittently by the same person: first one reads, then one writes, and then one reads some more. Hypertext, which creates an active, even intrusive reader, carries this convergence of activities one step closer to completion; but in so doing, it infringes on the power of the writer, removing some of it and granting it to the reader. These shifts in the relations of author and reader do not, however, imply that hypertext automatically makes readers into authors or co-authors—except, that is, in hypertext environments that give readers the ability to add links and texts to what they read.[2]

One clear sign of such transference of authorial power appears in the reader's abilities to choose his or her way through the metatext, to annotate text written by others, and to create links between documents written by others. Read-write hypertext like Intermedia or Weblogs that accept comments do not permit the active reader to change the text produced by another person, but it does narrow the phenomenological distance that separates

individual documents from one another in the worlds of print and manuscript. In reducing the autonomy of the text, hypertext reduces the autonomy of the author. In the words of Michael Heim, "as the authoritativeness of text diminishes, so too does the recognition of the private self of the creative author" (*Electric Language,* 221). Granted, much of that so-called autonomy had been illusory and existed as little more than the difficulty that readers had in perceiving connections between documents. Nonetheless, hypertext—which I am here taking as the convergence of poststructuralist conceptions of textuality and electronic embodiments of it—does do away with certain aspects of the authoritativeness and autonomy of the text, and in so doing it does reconceive the figure and function of authorship. One powerful instance of the way hypermedia environments diminish the author's control over his or her own text appears in the way so-called open systems permit readers to insert links into a lexia written by someone else. Portal Maximizer, for example, permits overlaying one author's Web documents with another author's links, although the original document remains unchanged.[3]

William R. Paulson, who examines literature from the vantage point of information theory, arrives at much the same position when he argues that "to characterize texts as artificially and imperfectly autonomous is not to eliminate the role of the author but to deny the reader's or critic's submission to any instance of authority. This perspective leaves room neither for authorial mastery of a communicative object nor for the authority of a textual coherence so complete that the reader's (infinite) task would be merely to receive its rich and multilayered meaning." Beginning from the position of information theory, Paulson finds that in "literary communication," as in all communication, "there is an irreducible element of noise," and therefore "the reader's task does not end with reception, for reception is inherently flawed. What literature solicits of the reader is not simply receptive but the active, independent, autonomous construction of meaning" (139). Finding no reason to exile the author from the text, Paulson nonetheless ends up by assigning to the reader a small portion of the power that, in earlier views, had been the prerogative of the writer.

Hypertext and contemporary theory reconceive the author in a second way. As we shall observe when we examine the notion of collaborative writing, both agree in configuring the author of the text as a text. As Barthes explains in his famous exposition of the idea, "this 'I' which approaches the text is already itself a plurality of other texts, of codes which are infinite" (*S/Z,* 10). Barthes's point, which should seem both familiar and unexceptional to anyone who has encountered Joyce's weaving of Gerty McDowell out of the

texts of her class and culture, appears much clearer and more obvious from the vantage point of intertextuality. In this case, as in others at which we have already looked, contemporary theory proposes and hypertext disposes; or, to be less theologically aphoristic, hypertext embodies many of the ideas and attitudes proposed by Barthes, Derrida, Foucault, and others.

One of the most important of these ideas involves treating the self of author and reader not simply as (print) text but as a hypertext. For all these authors the self takes the form of a decentered (or centerless) network of codes that, on another level, also serves as a node within another centerless network. Jean-François Lyotard, for example, rejects nineteenth-century Romantic paradigms of an islanded self in favor of a model of the self as a node in an information network: "A self does not amount to much," he assures us with fashionable nonchalance, "but no self is an island; each exists in a fabric of relations that is now more complex and mobile than ever before. Young or old, man or woman, rich or poor, a person is always located at 'nodal points' of specific communication circuits, however tiny these may be. Or better: one is always located at a post through which various kinds of messages pass" (*Postmodern Condition*, 15). Lyotard's analogy becomes even stronger if one realizes that by "post" he most likely means the modern European post office, which is a telecommunications center containing telephones and other networked devices.

Some theorists find the idea of participating in a network to be demeaning and depressing, particularly since contemporary conceptions of textuality deemphasize autonomy in favor of participation. Before succumbing to posthumanist depression, however, one should place Foucault's statements about "the author's disappearance" in the context of recent discussions of machine intelligence (Foucault, "What Is an Author?" 119). According to Heinz Pagels, machines capable of complex intellectual processing will "put an end to much discussion about the mind-body problem, because it will be very hard not to attribute a conscious mind to them without failing to do so for more human beings. Gradually the popular view will become that consciousness is simply 'what happens' when electronic components are put together the right way" (92). Pagels's thoughts on the eventual electronic solution to the mind-body problem recall Foucault's discussion of "the singular relationship that holds between an author and a text [as] the manner in which a text apparently points to this figure who is outside and precedes it" ("What Is an Author?" 115). This point of view makes apparent that literature generates precisely such appearance of a self, and that, moreover, we have long read a self "out" of texts as evidence that a unified self exists "behind" or "within"

or "implicit in" it. The problem for anyone who yearns to retain older conceptions of authorship or the author function lies in the fact that radical changes in textuality produce radical changes in the author figure derived from that textuality. Lack of textual autonomy, like lack of textual centeredness, immediately reverberates through conceptions of authorship as well. Similarly, the unboundedness of the new textuality disperses the author as well. Foucault opens this side of the question when he raises what, in another context, might be a standard problem in a graduate course on the methodology of scholarship:

> If we wish to publish the complete works of Nietzsche, for example, where do we draw the line? Certainly, everything must be published, but can we agree on what "everything" means? We will, of course, include everything that Nietzsche himself published, along with the drafts of his works, his plans for aphorisms, his marginalia; notations and corrections. But what if, in a notebook filled with aphorisms, we find a reference, a reminder of an appointment, an address, or a laundry bill, should this be included in his works? Why not? . . . If some have found it convenient to bypass the individuality of the writer or his status as an author to concentrate on a work, they have failed to appreciate the equally problematic nature of the word "work" and the unity it designates. (119)

Within the context of Foucault's discussion of "the author's disappearance" (119), the illimitable plenitude of Nietzsche's oeuvre demonstrates that there's more than one way to kill an author. One can destroy (what we mean by) the author, which includes the notion of sole authorship, by removing the autonomy of text. One can also achieve the same end by decentering text or by transforming text into a network. Finally, one can remove limits on textuality, permitting it to expand, until Nietzsche, the edifying philosopher, becomes equally the author of *The Gay Science* and laundry lists and other such trivia—as indeed he was. Such illimitable plenitude has truly "transformed" the author, or at least the older conception of him, into "a victim of his own writing" (117).

Fears about the death of the author, whether in complaint or celebration, derive from Claude Lévi-Strauss, whose mythological works demonstrated for a generation of critics that works of powerful imagination take form without an author. In *The Raw and the Cooked* (1964), for example, where he showed, "not how men think in myths, but how myths operate in men's minds without their being aware of the fact," he also suggests "it would perhaps be better to go still further and, disregarding the thinking subject completely, proceed as if the thinking process were taking place in the myths, in the

reflection upon themselves and their interrelation" (12).[4] Lévi-Strauss's presentation of mythological thought as a complex system of transformations without a center turns it into a networked text—not surprising, since the network serves as one of the main paradigms of synchronous structure.[5] Edward Said claims that the "two principal forces that have eroded the authority of the human subject in contemporary reflection are, on the one hand, the host of problems that arise in defining the subject's authenticity and, on the other, the development of disciplines like linguistics and ethnology that dramatize the subject's anomalous and unprivileged, even untenable, position in thought" (293). One may add to this observation that these disciplines' network paradigms also contribute importantly to this sense of the attenuated, depleted, eroding, or even vanishing subject.

Some authors, such as Said and Heim, derive the erosion of the thinking subject directly from electronic information technology. Said, for example, claims it is quite possible to argue "that the proliferation of information (and what is still more remarkable, a proliferation of the hardware for disseminating and preserving this information) has hopelessly diminished the role apparently played by the individual" (51).[6] Michael Heim, who believes loss of authorial power to be implicit in all electronic text, complains: "Fragments, reused material, the trails and intricate pathways of 'hypertext,' as Ted Nelson terms it, all these advance the disintegration of the centering voice of contemplative thought. The arbitrariness and availability of database searching decreases the felt sense of an authorial control over what is written" (*Electric Language*, 220). A database search, in other words, permits the active reader to enter the author's text at any point and not at the point the author chose as the beginning. Of course, as long as we have had indices, scholarly readers have dipped into specialist publications before or (shame!) instead of reading them through from beginning to end. In fact, studies of the way specialists read periodicals in their areas of expertise confirm that the linear model of reading is often little more than a pious fiction for many expert readers (McKnight, Richardson, and Dillon, "Journal Articles").

Although Heim here mentions hypertext in relation to the erosion of authorial prerogative, the chief problem, he argues elsewhere, lies in the way "digital writing turns the private solitude of reflective reading and writing into a public network where the personal symbolic framework needed for original authorship is threatened by linkage with the total textuality of human expressions" (*Electric Language*, 215). Unlike most writers on hypertext, he finds participation in a network a matter for worry rather than celebration, but he describes the same world they do, though with a strange

combination of prophecy and myopia. Heim, who sees this loss of authorial control in terms of a corollary loss of privacy, argues that "anyone writing on a fully equipped computer is, in a sense, directly linked with the totality of symbolic expressions—more so and essentially so than in any previous writing element" (215). Pointing out that word processing redefines the related notions of publishing, making public, and privacy, Heim argues that anyone who writes with a word processor cannot escape the electronic network: "Digital writing, because it consists of electronic signals, puts one willy-nilly on a network where everything is constantly published. Privacy becomes an increasingly fragile notion. Word processing manifests a world in which the public itself and its publicity have become omnivorous; to make public has therefore a different meaning than ever before" (215). Although in 1987 Heim much exaggerated the loss of privacy inherent in writing with word-processing software per se, he turns out, as Weblog diaries prove, to have been prescient. When he wrote, most people did not in fact do most of their writing on networks, but the Internet changes everything: e-mail and personal blogs blur the boundaries between public and private.[7] Although Heim may possibly overstate the case for universal loss of privacy—the results are not in yet—he has accurately presented both some implications of hypertext for writers and the reactions against them by the print author accustomed to the fiction of the autonomous text.

The third form of reconfiguration of self and author shared by theory and hypertext concerns the decentered self, an obvious corollary to the network paradigm. As Said points out, major contemporary theorists reject "the human subject as grounding center for human knowledge. Derrida, Foucault, and Deleuze . . . have spoken of contemporary knowledge (*savoir*) as decentered; Deleuze's formulation is that knowledge, insofar as it is intelligible, is apprehensible in terms of *nomadic centers,* provisional structures that are never permanent, always straying from one set of information to another" (376). These three contemporary thinkers advance a conceptualization of thought best understood, like their views of text, in an electronic, virtual, hypertextual environment.

Before mourning too readily for this vanished or much diminished self, we would do well to remind ourselves that, although Western thought long held such notions of the unitary self in a privileged position, texts from Homer to Freud have steadily argued the contrary position. Divine or demonic possession, inspiration, humors, moods, dreams, the unconscious—all these devices that serve to explain how human beings act better, worse, or just different from their usual behavior argue against the unitary conception

of the self so central to moral, criminal, and copyright law. The editor of the Soncino edition of the Hebrew Bible reminds us that

> Balaam's personality is an old enigma, which has baffled the skill of commentators . . . He is represented in Scripture as at the same time heathen sorcerer, true Prophet, and the perverter who suggested a peculiarly abhorrent means of bringing about the ruin of Israel. Because of these fundamental contradictions in character, Bible Critics assume, that the Scriptural account of Balaam is a combination of two or three varying traditions belonging to different periods . . . Such a view betrays a slight knowledge of the fearful complexity of the mind and soul of man. It is only in the realm of Fable that men and women display, as it were in a single flash of light, some one aspect of human nature. It is otherwise in real life. (668)

Given such long observed multiplicities of the self, we are forced to realize that notions of the unitary author or self cannot authenticate the unity of a text.[8] The instance of Balaam also reminds us that we have access to him only in Scriptures and that it is the biblical text, after all, which figures the unwilling prophet as a fractured self.

How the Print Author Differs

from the Hypertext Author

Authors who have experienced writing within a hypertext environment often encounter certain predictable frustrations when returning to write for the linear world of print. Such frustrations derive from repeated recognitions that effective argument requires closing off connections and abandoning lines of investigation that hypertextuality would have made available. Here are two examples of what I mean. Near the opening of this chapter, in the midst of discussing the importance of Lévi-Strauss to recent discussions of authorship, I made the following statement: "Lévi-Strauss's presentation of mythological thought as a complex system of transformations without a center turns it into a networked text—not surprising, since the network serves as one of the main paradigms of synchronous structure"; and to this text I appended a note, pointing out that in *The Scope of Anthropology* "Lévi-Strauss also employs this model for societies as a whole: 'Our society, a particular instance in a much vaster family of societies, depends, like all others, for its coherence and its very existence on a network—grown infinitely unstable and complicated among us—of ties between consanguineal families.'" At this point in the main text, I had originally planned to place Foucault's remark that "we can easily imagine a culture where discourse would circulate without any need for an author" ("What Is an Author?" 138), and to this remark I had considered adding the observation that, yes, we can easily "imagine" such a culture, but we do not

have to do so, since Lévi-Strauss's mythographic works have provided abundant examples of it. Although the diachronic relationship between these two influential thinkers seemed worthy of notice, I could not add the passage from Foucault and my comment because it disturbed my planned line of argument, which next required Said's relation of ethnology and linguistics to the erosion of "the authority of the human subject" in contemporary thought. I did not want to veer off in yet another direction. I then considered putting this observation in note 7, but again, it also seemed out of place there.

Had I written this chapter within a hypertext environment, the need to maintain a linear thrust would not have required this kind of choice. It would have required choices, but not this kind, and I could have linked two or more passages to this point in the main text, thereby creating multiple contexts both for my argument and for the quoted passage that served as my point of departure. I am not urging, of course, that in its print form this chapter has lost something of major importance because I could not easily append multiple connections without confusing the reader. (Had my abandoned remark seemed important enough to my overall argument, I could have managed to include it in several obvious ways, such as adding another paragraph or rewriting the main text to provide a point from which to hang another note.) No, I make this point to remind us that, as Derrida emphasizes, the linear habits of thought associated with print technology often influence us to think in particular ways that require narrowness, decontextualization, and intellectual attenuation, if not downright impoverishment. Linear argument, in other words, forces one to cut off a quoted passage from other, apparently irrelevant contexts that in fact contribute to its meaning. The linearity of print also provides the passage with an illusory center whose force is intensified by such selection.

A second example points to another kind of exclusion associated with linear writing. During the course of composing the first three chapters of this book, several passages, such as Barthes's description of the writerly text and Derrida's exposition of borders, boundaries, and *débordement*, forced themselves into the line of argument and hence deserved inclusion seven or eight times. One can repeatedly refer to a particular passage, of course, by combining full quotation, selections, and skillful paraphrase, but in general the writer can concentrate on a quoted section of text in this manner only when it serves as the center, or one of the centers, of the argument. If I wished to write a chapter or an entire book about Derridean *débordement*, I could return repeatedly to it in different contexts, thereby revealing its richness of implication. But that is not the book I wished to write in 1991, or wish to write now,

nor is that the argument I wish to pursue here, and so I suppress that text and argument, which henceforth exist only in potentia. After careful consideration, I decide which of the many places in the text would most benefit from introduction of the quotation and then at the appropriate moment, I trundle it forward. As a result, I necessarily close off all but a few of its obvious points of connection.

As an experienced writer accustomed to making such choices, I realize that selection is one of the principles of effective argument. But why does one have to write texts in this way? If I were writing a hypertext version of this text—and the versions would exist so differently that one has to place quotation marks around "version" and "text," and probably "I" as well—I would not have to choose to write a single text. I could, instead, produce one that contained a plurality of ways through it. For example, after preparing the reader for Derrida's discussion of *débordement*, I could then link my preparatory remarks either to the passage itself or to the entire text of "Living On," and I could provide temporary markings that would indicate the beginning and end of the passage I wished to emphasize. At the same time, my hypertext would link the same passage to other points in my argument. How would I go about creating such links?

To answer this question, let me return to my first and simpler example, which involved linking passages from Lévi-Strauss's *Scope of Anthropology* and Foucault's "What Is an Author?" to a remark about the anthropologist's use of the network model. Let's look at how one makes a link in three different hypermedia environments, Intermedia, Storyspace, and HTML (for the Web). Unlike creating links in HTML, linking in Microcosm, Storyspace, and Intermedia follows the now common cut-and-paste paradigm found in word processors, graphics editors, and spread sheets. Using the mouse or other pointing device, one places the cursor immediately before the first letter of the first word in the passage in question, the sign of which is that the text appears highlighted—that is, it appears within a black rectangle, and the black type against a white background now appears in reverse video, white lettering against a black background. With the text highlighted, one moves the mouse until the point of the arrow-shaped cursor covers any part of the word "Intermedia" that appears in a horizontal list of words at the top of the screen ("File," "Edit," "Intermedia," and so on). Holding down the mouse button, one draws the cursor down, thereby producing the Intermedia menu, which contains choices. Placing the pointer over "Start Link," one releases the mouse button, proceeds to the second text, and carries out the same operation until one opens the Intermedia menu, at which point one chooses "Complete Link."

The system then produces a panel containing places to type any desired labels for the linked passages; it automatically adds the title of the entire text, and the writer can describe the linked passage within that text. For example, if I created a link between the hypermedia equivalent of my text for the previous section of this chapter and a passage in *The Scope of Anthropology*, Intermedia would automatically add the title of that text, "The Erosion of the Author," to which I would add a phrase, say, "Lévi-Strauss & myth as network." At the other end of the link, the system would furnish "Claude Lévi-Strauss, *The Scope of Anthropology*," and I would add something like "Lévi-Strauss & society as network." When a reader activates the link marker in the main text, the new entry appears as an option: "Claude Lévi-Strauss, *The Scope of Anthropology* : (Lévi-Strauss & society as network)." Storyspace linking involves a roughly similar, if simpler, procedure: to link from a phrase to another document, one highlights the phrase, moves the cursor to a palette containing an arrow, clicks on it, and then clicks on the other document, at which point a panel appears in which one can place a description. To make a link in HTML (which only permits one link per anchor), one has to type something like how men think in myths, or use a handy html editor like BBEdit or Dreamweaver, which would add the HTML tag () after I typed in the information between quotation marks (../../levistrauss/1.html).

In Storyspace, Intermedia, and similar programs, linking the second text, the passage from Foucault, follows the identical procedure with the single exception that one no longer has to provide a label for the lexia in the main text, since it already has one. In HTML one has to sacrifice this second link or find another appropriate phrase to which one could add a link.

If instead of linking these two brief passages of quotation, documentation, and commentary, I created a more complex document set, focused on Derridean *débordement*, one would follow the same procedure to create links. In addition, one would also create kinds of documents not found in printed text, some of which would be primarily visual or hieroglyphic. One, for example, might take the form of a concept map showing, among other things, uses of the term *débordement* in "Living On," other works by Derrida in which it appears, and its relation to a range of contexts and disciplines from cartography and histology to etymology and French military history. Current hypermedia systems, including popular World Wide Web browsers, permit linking to interactive video, music, and animation as well as dictionaries, text, time lines, and static graphics. In the future these links will take more dynamic forms, and following them will animate some procedure, say,

a search through a French thesaurus, or a reader-determined tracking of *débordement* created after I had completed my document would automatically become available.

My brief description of how I would go about producing this text were I writing it in something like a complete hypertext environment might trouble some readers because it suggests that I have sacrificed a certain amount of authorial control, ceding some of it to the reader. The act of writing has also changed to some extent. Electronic hypertext and contemporary discussions of critical theory, particularly those of the poststructuralists, display many points of convergence, but one point on which they differ is tone. Whereas most writings on theory, with the notable exception of Derrida, are models of scholarly solemnity, records of disillusionment and brave sacrifice of humanistic positions, writers on hypertext are downright celebratory. Whereas terms like *death, vanish, loss,* and expressions of depletion and impoverishment color critical theory, the vocabulary of freedom, energy, and empowerment marks writings on hypertextuality. One reason for these different tones may lie in the different intellectual traditions, national and disciplinary, from which they spring. A more important reason, I propose, is that critical theorists, as I have tried to show, continually confront the limitation—indeed, what they somewhat prematurely take to be the exhaustion—of the culture of print. They write from an awareness of limitation and shortcoming, and from a moody nostalgia, often before the fact, at the losses their disillusionment has brought and will bring. Writers on hypertext, in contrast, glory in possibility, excited by the future of textuality, knowledge, and writing. Another way of putting this opposing tone and mood is that most writers on critical theory, however brilliantly they may theorize a much-desired new textuality, nonetheless write from within daily experience of the old and only of the old. Many writers on hypertext, on the other hand, have already had some experience of hypertext systems, and they therefore write from a different experiential vantage point. Most poststructuralists write from within the twilight of a wished-for coming day; most writers of hypertext write about many of the same things from within the dawn.

Virtual Presence

Many features of hypermedia derive from its creating the virtual presence of all the authors who contribute to its materials. Computer scientists draw on optics for an analogy when they speak of "virtual machines" created by an operating system that provides individual users sharing a system with the sense of working on their own individual machines. In the first chapter, when discussing electronic textuality,

I pointed to another kind of "virtual" existence, the virtual text: all texts that one encounters on the computer screen are virtual, rather than real. In a similar manner, the reader experiences the virtual presence of other contributors.

Such virtual presence is of course a characteristic of all technology of cultural memory based on writing and symbol systems. Since we all manipulate cultural codes—particularly language but also mathematics and other symbols—in slightly different ways, each record of an utterance conveys a sense of the one who makes that utterance. Hypermedia differs from print technology, however, in several crucial ways that amplify this notion of virtual presence. Because the essential connectivity of hypermedia removes the physical isolation of individual texts characteristic of print technology, the presence of individual authors becomes both more available and more important. The characteristic flexibility of this reader-centered information technology means, quite simply, that writers have a much greater presence in the system, as potential contributors and collaborative participants but also as readers who choose their own paths through the materials.

Collaborative Writing,

Collaborative Authorship

The virtual presence of other texts and other authors contributes importantly to the radical reconception of authorship, authorial property, and collaboration associated with hypertext. Within a hypertext environment all writing becomes collaborative writing, doubly so. The first element of collaboration appears when one compares the roles of writer and reader, since the active reader necessarily collaborates with the author in producing the particular version of the text she or he reads by the choices she or he makes—a fact much more obvious in very large hypertexts than in smaller hyperfictions. The second aspect of collaboration appears when one compares the writer with other writers— that is, the author who is writing now with the virtual presence of all writers "on the system" who wrote then but whose writings are still present.

The word *collaboration,* which derives from the Latin for *working* plus that for *with* or *together,* conveys the suggestion, among others, of working side by side on the same endeavor. Most people's conceptions of collaborative work take the form of two or more scientists, songwriters, or the like continually conferring as they pursue a project in the same place at the same time. I have worked on an essay with a fellow scholar in this manner. One of us would a type a sentence, at which point the other would approve, qualify, or rewrite it, and then we would proceed to the next sentence. Far more common a form of collaboration, I suspect, is that second mode described as "versioning," in

which one worker produces a draft that another person then edits by modifying and adding. The first and the second forms of collaborative authorship tend to blur, but the distinguishing factor here is that versioning takes place out of the presence of the other collaborator and at a later time.

Both of these models require considerable ability to work productively with other people, and evidence suggests that many people either do not have such ability or do not enjoy putting it into practice. In fact, according to those who have carried out experiments in collaborative work, a third form proves more common than the first two—the assembly-line or segmentation model of working together, according to which individual workers divide the overall task and work entirely independently. This last mode is the form that most people engaged in collaborative work choose when they work on projects ranging from programming to art exhibitions.

Networked hypertext systems like the World Wide Web, Hyper-G, Sepia, and Intermedia offer a fourth model of collaborative work that combines aspects of the previous ones. By emphasizing the presence of other texts and their cooperative interaction, networked hypertext makes all additions to a system simultaneously a matter of versioning and of the assembly-line model. Once ensconced within a network of electronic links, a document no longer exists by itself. It always exists in relation to other documents in a way that a book or printed document never does and never can. From this crucial shift in the way texts exist in relation to others derive two principles that, in turn, produce this fourth form of collaboration: first, any document placed on any networked system that supports electronically linked materials potentially exists in collaboration with any and all other documents on that system; second, any document electronically linked to any other document collaborates with it.

According to the *American Heritage Dictionary of the English Language,* the verb *to collaborate* can mean either "to work together, especially in a joint intellectual effort," or "to cooperate treasonably, as with an enemy occupying one's country." The combination of labor, political power, and aggressiveness that appears in this dictionary definition well indicates some of the problems that arise when one discusses collaborative work. On the one hand, the notion of collaboration embraces notions of working together with others, of forming a community of action. This meaning recognizes, as it were, that we all exist within social groups, and it obviously places value on contributions to that group. On the other hand, collaboration also includes a deep suspicion of working with others, something aesthetically as well as emotionally engrained since the advent of Romanticism, which exalts the idea of individual

effort to such a degree that it, like copyright law, often fails to recognize, or even suppresses, the fact that artists and writers work collaboratively with texts created by others.

Most of our intellectual endeavors involve collaboration, but we do not always recognize that fact for two reasons. The rules of our intellectual culture, particularly those that define intellectual property and authorship, do not encourage such recognitions, and furthermore, information technology from Gutenberg to the present—the technology of the book—systematically hinders full recognition of collaborative authorship.

Throughout the past century the physical and biological sciences have increasingly conceived of scientific research, authorship, and publication as group endeavors. The conditions of scientific research, according to which many research projects require the cooperating services of a number of specialists in the same or (often) different fields, bear some resemblances to the medieval guild system in which apprentices, journeymen, and masters all worked on a single complex project. Nonetheless, "collaborations differ depending on whether the substance of the research involves a theoretical science, such as mathematics, or an empirical science, such as biology or psychology. The former are characterized by collaborations among equals, with little division of labor, whereas the latter are characterized by more explicit exchange of services, and more substantial division of labor" (Galegher, Egido, and Kraut, 151). The financing of scientific research, which supports the individual project, the institution at which it is carried out, and the costs of educating new members of the discipline all nurture such group endeavors and consequent conceptions of group authorship.[9]

In general, the scientific disciplines rely on an inclusive conception of authorship: anyone who has made a major contribution to finding particular results, occasionally including specialized technicians and those who develop techniques necessary to carry out a course of research, can appear as authors of scientific papers, and similarly, those in whose laboratories a project is carried out may receive authorial credit if an individual project and the publication of its results depend intimately on their general research. In the course of a graduate student's research for a dissertation, he or she may receive continual advice and evaluation. When the student's project bears fruit and appears in the form of one or more publications, the advisor's name often appears as co-author.

Not so in the humanities, where graduate student research is supported largely by teaching assistantships and not, as in the sciences, by research funding. Although an advisor of a student in English or art history often

acts in ways closely paralleling the advisor of the student in physics, chemistry, or biology, explicit acknowledgments of cooperative work rarely appear. Even when a senior scholar provides the student with a fairly precise research project, continual guidance, and access to crucial materials that the senior scholar has discovered or assembled, the student does not include the advisor as co-author.

The marked differences between conceptions of authorship in the sciences and the humanities demonstrate the validity of Michel Foucault's observation that "the 'author-function' is tied to the legal and institutional systems that circumscribe, determine, and articulate the realm of discourses; it does not operate in a uniform manner in all discourses, at all times, and in any given culture it is not defined by the spontaneous attribution of a text to its creator, but through a series of precise and complex procedures; it does not refer, purely and simply, to an actual individual" ("What Is an Author?" 131). One reason for the different conceptions of authorship and authorial property in the humanities and the sciences lies in the different conditions of funding and the different discipline-politics that result.

Another corollary reason is that the humanistic disciplines, which traditionally apply historical approaches to the areas they study, consider their own assumptions about authorship, authorial ownership, creativity, and originality to be eternal verities.[10] In particular, literary studies and literary institutions, such as departments of English, which still bathe themselves in the afterglow of Romanticism, uncritically inflate Romantic notions of creativity and originality to the point of absurdity. An example comes readily to hand from the preface of Lisa Ede and Andrea Lunsford's recent study of collaborative writing, the production of which they discovered to have involved "acts of subversion and of liberatory significance": "We began collaborating in spite of concerned warnings of friends and colleagues, including those of Edward P. J. Corbett, the person in whose honor we first wrote collaboratively. We knew that our collaboration represented a challenge to traditional research conventions in the humanities. Andrea's colleagues (at the University of British Columbia) said so when they declined to consider any of her coauthored or coedited works as part of a review for promotion" (ix–x).

Ede and Lunsford, whose interest in their subject grew out of the "difference between our personal experience as coauthors and the responses of many of our friends and colleagues" (5), set the issue of collaborative writing within the contexts of actual practice in the worlds of business and academia, the history of theories of creative individualism and copyright in recent Western culture, contemporary and feminist analyses of many of these other con-

texts. They produce a wide range of evidence in convincingly arguing that "the pervasive commonsense assumption that writing is inherently and necessarily a solitary, individual act" (5) supports a traditional patriarchal construction of authorship and authority. After arguing against "univocal psychological theories of the self" (132) and associated notions of an isolated individualism, Ede and Lunsford call for a more Bakhtinian reconception of the self and for what they term a *dialogic*, rather than a hierarchical, mode of collaboration.

I shall return to their ideas when I discuss the role of hypertext in collaborative learning, but now I wish to point out that as scholars from McLuhan and Eisenstein to Ede and Lunsford have long argued, book technology and the attitudes it supports are the institutions most responsible for maintaining exaggerated notions of authorial individuality, uniqueness, and ownership that often drastically falsify the conception of original contributions in the humanities and convey distorted pictures of research. The sciences take a relatively expansive, inclusive view of authorship and consequently of text ownership.[11] The humanities take a far more restricted view that emphasizes individuality, separation, and uniqueness—often creating a vastly distorted view of the connection of a particular text to those that preceded it. Neither view possesses an obvious rightness. Each is obviously a social construction, and each has on occasion proved to distort actual conditions of intellectual work carried out in a particular field.

Whatever the political, economic, and other discipline-specific factors that maintain the conception of noncooperative authorship in the humanities, print technology has also contributed to the sense of a separate, unique text that is the product—and hence the property—of one person, the author. Hypertext changes all this, in large part because it does away with the isolation of the individual text that characterizes the book. As McLuhan and other students of the cultural influence of print technology have pointed out, modern conceptions of intellectual property derive both from the organization and financing of book production and from the uniformity and fixity of text that characterizes the printed book. J. David Bolter explains that book technology itself created new conceptions of authorship and publication:

Because printing a book is a costly and laborious task, few readers have the opportunity to become published authors. An author is a person whose words are faithfully copied and sent round the literary world, whereas readers are merely the audience for those words. The distinction meant less in the age of manuscripts, when "publication" was less of an event and when the reader's own notes and glosses had the same status as the text itself. Any reader could decide to cross over and become an author:

one simply sat down and wrote a treatise or put one's notes in a form for others to read. Once the treatise was written, there was no difference between it and the works of other "published" writers, except that the more famous works existed in more copies. (*Writing Space*, 148–49)

Printing a book requires a considerable expenditure of capital and labor, and the need to protect that investment contributes to notions of intellectual property. But these notions would not be possible in the first place without the physically separate, fixed text of the printed book. Just as the need to finance printing of books led to a search for the large audiences that in turn stimulated the ultimate triumph of the vernacular and fixed spelling, so, too, the fixed nature of the individual text made possible the idea that each author produces something unique and identifiable as property.

The needs of the marketplace, as least as they are conceived by editors and publishing houses, reinforce all the worst effects of these conceptions of authorship in both academic and popular books. Alleen Pace Nilsen reports that Nancy Mitford and her husband wrote the best-selling *The High Cost of Death* together, but only her name appears because the publisher urged that multiple authors would cut sales. Another common solution involves resorting to a pseudonym: Perri O'Shaunessy is the pen-name of Pam and Mary O'Shaunessy, created when their editors would not permit a double-author byline, and John Case, "author" of *The Genesis Code*, "is really husband-and-wife team Jim and Carolyn Hougan."[12] In another case, to make a book more marketable a publisher replaced the chief editor of a major psychiatric textbook with the name of a prestigious contributor who had not edited the volume at all (cited by Ede and Lunsford, 3–4). I am sure everyone has examples of such distortion of authorial practice by what a publisher believes to be good business. I have mine: a number of years ago after an exercise in collaborative work and writing with three graduate students produced a publishable manuscript, we decided by mutual agreement on the ordering of authors' names on the title page. By the time the volume appeared, the three former graduate students all held teaching positions, and its appearance, one expects, might have helped them professionally. Unfortunately, the publisher insisted on including only the first editor's name in all notices, advertisements, and catalogues. Such an action, of course, does not have so serious an effect as removing the editors' names from the title page, but it certainly discriminates unfairly between the first two editors, who did equal amounts of work, and it certainly conveys a strong message to beginning humanists about the culturally assigned value of cooperation and collaboration.

Even though print technology is not entirely or even largely responsible for current attitudes in the humanities toward authorship and collaboration, a shift to hypertext systems would change them by emphasizing elements of collaboration. As Tora K. Bikson and J. D. Eveland point out in relation to other, nonhumanities work, "The electronic environment is a rich context in which doing work and sharing work becomes virtually indistinguishable" (286). If we can make ourselves aware of the new possibilities created by these changes, we can at the very least take advantage of the characteristic qualities of this new form of information technology.

One relevant characteristic quality of networked hypertext systems is that they produce a sense of authorship, authorial property, and creativity that differs markedly from those associated with book technology. Hypertext changes our sense of authorship and creativity (or originality) by moving away from the constrictions of page-bound technology. In so doing, it promises to have an effect on cultural and intellectual disciplines as important as those produced by earlier shifts in the technology of cultural memory that followed the invention of writing and printing (see Bolter, McLuhan, and Eisenstein).

Examples of Collaboration

in Hypertext

Collaborative work in hypertext takes many forms, one of the most interesting of which illustrates the principle that one almost inevitably works collaboratively whenever creating documents on a multiauthor hypertext system. I discovered the inevitably collaborative nature of hypermedia authorship in the old Intermedia days. While linking materials to the overview (or sitemap) for Graham Swift's *Waterland* (1983), I observed Nicole Yankelovich, project coordinator of the Intermedia project at IRIS, working on materials for a course in arms control and disarmament offered by Richard Smoke of Brown University's Center for Foreign Policy Development. Those materials, which were created by someone from a discipline very different from mine for a very different kind of course, filled a major gap in a project I was working on. Although my co-authors and I had created materials about technology, including graphic and text documents on canals and railroads, to attach to the science and technology section of the *Waterland* overview, we did not have the expertise to create parallel documents about nuclear technology and the antinuclear movement, two subjects that play a significant part in Swift's novel. Creating a brief introduction to the subject of *Waterland* and nuclear disarmament, I linked it first to the science and technology section in the *Waterland* overview and then to the time line that the nuclear arms course materials employ as a directory file. A brief document and a few links enable students in the intro-

ductory survey of English literature to explore the materials created for a course in another discipline. Similarly, students from that course could now encounter materials showing the effects on contemporary fiction of the concerns covered in their political science course. Hypertext thus allows and encourages collaborative work, and at the same time it encourages interdisciplinary approaches by making materials created by specialists in different disciplines work together—collaborate.

This kind of collaboration-by-link occurs all the time on the World Wide Web. Each time a student or faculty member from another institution has one of their documents added to *The Victorian Web*—say, on characterization or race, class, and gender in *Jane Eyre*—they automatically join in a discussion on these topics. Similarly, Phil Gyford's translation of Pepys's *Diaries* into a Weblog, at which we looked in the previous chapter, exemplifies yet another approach to collaboration on the Web.

The important point here is that hypermedia linking automatically produces collaboration. Looking at the way the arms control materials joined to those supporting the four English courses, one encounters a typical example of how the connectivity that characterizes hypertext transforms independently produced documents into collaborative ones and authors working alone into collaborative authors. When one considers the arms control materials from the point of view of their originator, they exist as part of a discrete body of materials. When one considers them from the vantage point of a reader, their status changes: as soon as they appear within a hypertext environment, these and all other documents then exist as part of a larger system and in relation therefore to other materials on that system. By forming electronic pathways between blocks of texts, links actualize the potential relations between them. Just as hypertext as an educational medium transforms the teacher from a leader into a kind of coach or companion, hypertext as a writing medium metamorphoses the author into an editor or developer. Hypermedia, like cinema and video or opera, is a team production.

5

Reconfiguring Writing

Since writing hypermedia successfully involves finding ways to prevent readers from becoming confused and discouraged when they encounter text in e-space, let us examine this notion of disorientation before considering some of the methods used to prevent it. Crucial as disorientation might seem to discussions of hypertext authoring, this term remains unexamined and inadequately defined. Such a claim might appear particularly odd because writers on the subject since Jeff Conklin have apparently provided fairly precise statements of what they mean by what Conklin himself termed the *disorientation problem.* According to his initial statement of the issue, disorientation seems to inhere in the medium itself: "Along with the power of being able to organize information much more complexly comes the problem of having to know (1) where you are in the network and (2) how to get to some other place that you know (or think) exists in the network. I call this the *disorientation problem.* Of course, one has a disorientation in traditional linear text documents, but in a linear text the reader has only two options: He can search for the desired text earlier in the text or later in the text" (38). Kenneth Utting and Nicole Yankelovich, who similarly point out that "hypermedia . . . has the potential to dramatically confuse and confound readers, writers, teachers, and learners," quote Conklin's definition of disorientation as "the tendency to lose one's sense of location and direction in a nonlinear document" (58), and in their example of three aspects of disorientation, they mention "confusion about where to go or, having decided on a destination, how to get there," and also disorientation in the sense of not knowing "the boundaries of the information space" (61) one is exploring.

Three points here demand notice. First, the concept of disorientation relates closely to the tendency to use spatial, geographical, and travel metaphors to describe the way users experience hypertext. Such uses are obviously appropriate to dictionary definitions of *disorient*. Neither *The American Heritage Dictionary* nor *Webster's Collegiate Dictionary* defines *disorientation*, but according to *The American Heritage Dictionary*, to disorient is "to cause to lose one's sense of direction or location, as by removing from a familiar environment," and *Webster's* offers three definitions of *disorient*: (1) "to cause to lose one's bearings: displace from normal position or relationship"; (2) "to cause to lose the sense of time, place, or identity"; and (3) "to confuse."

In general, authors writing about hypertext seem to mean *confuse* and specifically *lose bearings* when they use the term, and this usage derives from commonplace application of spatial metaphors to describe the reader's behavior in a hypertext environment. Thus, in "The Art of Navigating through Hypertext," Jakob Nielsen points out in the usual formulation that "one of the major usability problems with hypertext is the user's risk of disorientation while navigating the information space. For example, our studies showed that 56 percent of the readers of a document written in one of the most popular commercial hypertext systems agreed fully or partially with the statement *I was often confused about where I was*" (298). Nielsen believes that "true hypertext should also make users *feel* that they can move freely through the information according to their own needs" (298).

Second, as Conklin and others writing in this field state the problem of disorientation, it obviously concerns the design of the information technology alone. In other words, the related concepts of disorientation and confusion appear, in their terms, to have nothing to do with the materials, the content, on the hypertext system. Nonetheless, we all know that readers often experience confusion and disorientation simply because they fail to grasp the logic or even meaning of a particular argument. Even if the works of Kant, Einstein, and Heidegger were to appear on the finest hypertext and information retrieval system in the world, they would still disorient many readers. Although Conklin and other students of hypertext have not naively or incompletely defined what they mean by disorientation, their restriction of this term to system-generated disorientation in practice does not take into account a large portion of the actual reading experience—and its implications for hypertext authors. The issue has a bearing on a third point about the notion of disorientation.

Third, disorientation, as these comments make clear, is conceived by these authors as crippling and disenabling, as something, in other words,

that blocks completion of a task one has set for oneself or that has been set for one by others. Disorientation, furthermore, is presented as such a massive, monolithic problem that these authors pay little or no attention to how people actually cope with this experience. Is it, in fact, crippling, and do users of hypertext systems simply give up or fail in whatever tasks they have engaged themselves when they meet disorientation? As we shall see, expert users of hypertext do not always find the experience of disorientation to be particularly stressful, much less paralyzing.

The role of disorientation in literature suggests some reasons why this might be the case. Readers of literature in fact often describe the experience here presented as disorientation as pleasurable, even exciting, and some forms of literature, particularly those that emphasize either allegory or stylistic and narrative experimentation, rely on disorienting the reader as a primary effect. Although the kind of pleasurable disorientation that one finds in Dante's *Divine Comedy*, Browning's *Ring and the Book*, and Eliot's *Wasteland* derives from what we have termed the content and not from the information technology that presents it, this effect has one important parallel to that encountered in some forms of hypertext: in each case the neophyte or inexperienced reader finds unpleasantly confusing materials that more expert ones find a source of pleasure.

The Concept of Disorientation in the Humanities

The reasons for the radically different ways people in the humanities and technological disciplines regard disorientation become particularly clear in three areas—aesthetic theories of disorientation, conceptions of modernism and postmodernism as cultural movements, and the related conceptions of hypertext fiction.

The classic statement of the positive value of cognitive and other disorientation in aesthetic works appears in Morse Peckham's *Man's Rage for Chaos: Biology, Behavior, and the Arts* (1967), which argues that "art offers not order but the opportunity to experience more disorder than any other human artifact, and . . . artistic experience, therefore, is characterized . . . by disorientation" (41). According to him, "the artist's role is to create occasions for disorientation, and of the perceiver's role to experience it. The distinguishing mark of the perceiver's transaction with the work of art is discontinuity of experience, not continuity; disorder, not order; emotional disturbance, not emotional catharsis, even though some works have a cadential close" (254). Human beings so "passionately" want "a predictable and ordered world" that "only in protected situations, characterized by high walls of psychic insula-

tion," can they permit themselves to perceive the gap between "expectancy or set or orientation, and the data . . . interaction with the environment actually produces. . . Art offers precisely this kind of experience" (313).

Peckham argues finally that art is "an adaptational mechanism" that reinforces our ability to survive:

Art is rehearsal for those real situations in which it is vital for our survival to endure cognitive tension, to refuse the comforts of validation by affective congruence when such validation is inappropriate because too vital interests are at stake; art is the reinforcement of the capacity to endure disorientation so that a real and significant problem can emerge. Art is the exposure to the tensions and problems of a false world so that man can endure exposing himself to the tensions and problems of a real world. (314)

Peckham's positive views of aesthetic disorientation, which seem to grow out of the arts and literature of modernism, clearly present it as a matter of freedom and human development.

Students of literature and the arts have long emphasized the role of disorientation in both modernism and postmodernism. Like the works of the cubists, expressionists, and other movements of twentieth-century art, James Joyce's *Ulysses,* T. S. Eliot's *Wasteland,* and William Faulkner's *Sound and the Fury*—to cite three classics of literary modernism—all make disorientation a central aesthetic experience. Similarly, as recent writers on postmodernist fiction point out, it is characterized by a range of qualities that produce cognitive disorientation: "contradiction, discontinuity, randomness," "intractable epistemological uncertainty," and "cognitive estrangement" (McHale, 7, 11, 59). These attitudes, which students of the past century's culture almost universally view positively, appear throughout discussions of hypertext fiction as well. Robert Coover, for example, makes quite clear the relations between disorientation, hypertext, and the traditions of the avant garde when he describes the way hypertext fiction promises to fulfill the liberating functions of the experimental tradition in fiction.[1] He also emphasizes the effect on writers of this disorienting freedom. Discussing the conservatism of writing students, he claims that

getting them to consider trying out alternative or innovative forms is harder than talking them into chastity as a life-style. But suddenly, confronted with hyperspace, they have no choice: all the comforting structures have been erased. It's improvise or go home. Some frantically rebuild those old structures, some just get lost and drift out of sight, most leap in fearlessly without even asking how deep it is (*infinitely* deep),

admitting, even as they continue to paddle for dear life, that this new arena is indeed an exciting, provocative, if frequently frustrating medium for the creation of new narratives, a potentially revolutionary space, empowered, exactly as advertised, to transform the very art of fiction. ("End of Books," 24)

Michael Joyce describes potentially disorienting qualities of hypertext fiction in terms that praise the necessary activism required of readers: "Constructive hypertexts require a capability to act: to create, to change and to recover particular encounters within the developing body of knowledge. These encounters . . . are maintained as versions, i.e., trails, paths, webs, notebooks, etc.; but they are versions of what they are becoming, a structure for what does not yet exist" (*Of Two Minds,* 42). In much the same vein Stuart Moulthrop, like Coover, relates the experience of encountering gaps and disorientation that characterize the reader's experience in hypertext as potentially liberating. "In a world where the 'global variables' of power and knowledge tend to orient themselves toward singular, hegemonic world orders, it becomes increasingly difficult to jump outside 'the system.' And as Thomas Pynchon reminds us: 'Living inside the System is like riding across the country in a bus driven by a maniac bent on suicide' (*Gravity's Rainbow,* 412)" ("Beyond the Electronic Book," 76). Given the fact that many humanities users of hypertext, like those specifically concerned with hypertext fiction, associate the general experience of disorientation with avant-garde, liberating, and culturally approved aesthetic experience, it should be no surprise that they treat the issue of disorientation far differently than do almost all who consider it in the technical disciplines.

The Love of Possibilities

In experiments that Paul Kahn and I conducted in 1991 experienced student-users of hypertext showed a love of browsing and of the serendipity it occasions very much at odds with by-now conventional attitudes toward disorientation in hypertext. For example, one user explained that by "accidentally clicking" on a particular link he found that he had made a "delightful detour," since it led to an answer to one of the problems in information retrieval. "Although I guess this mistake has an analog in book technology, it would be the improbable act of being in the wrong section of the library, the wrong row of books, the wrong shelf, picking up the wrong book, and opening up magically to the correct page."

Some of these responses were disconcertingly unexpected and for that reason potentially quite valuable to anyone considering the design, implementation, and educational application of hypertext. In two cases very experienced programmers had more difficulties with certain aspects of information-

retrieval tasks than did comparative neophytes. It would appear that their expectations of systems and retrieval mechanisms served to hinder rather than to assist their explorations. Accustomed to using full-text search mechanisms in other kinds of computer systems, one of these students spent some fifteen minutes searching for one in Intermedia—the version used did not have the system's later search tools—and then gave up on the assignment, assuming that no other methods of locating the information existed.

In contrast, a relatively unsophisticated user solved the first problem of locating works by one scholar in a matter of moments. As he explained: "I found these references by opening the Critics Quoted Document in the Bibliographical Folder in the Dickens Folder . . . Total Time: 6 min." Another similarly responded, "I answered the first question of the assignment using [the Intermedia folder system]. Since the folders were labeled well, I found it quick and easy to first find the 'Bibliography' folder, and then open the 'Critics Quoted' document. There I found the names of the three authors in the question. Since the web was already engaged, I could activate the link markers and see all the destination documents connected to a particular author (if in fact the web was well linked). Thus, I approached the web from an odd angle, from the actual document folders, but it was the one which I felt to be the easiest and quickest for this question. This same information could be found in the Bibliography Overview . . . If I had never come across the Victorianism Overview, for whatever reason, I might never have come across the sought after bibliographic information. But I did find the information, outside the system's (few) attempts at organization. I felt so comfortable with the sight of the Macintosh document icon that I felt there was no 'violation,' as Intermedia depicts no structure to be violated—documents seem to be either autonomous or within the web" (MF).

This student's narrative forcefully restates the truism that people who want to find information will find it as much by what they know about that information as by system features alone. In other words, orientation by content seems able to solve potential problems of disorientation caused by the *system design considered in isolation. In this case, some experienced users* of computer tended to conceive this task as a means of testing system capacities whereas those who were content experts, or who *took the approach of a content expert,* conceived the task in terms that made the desired information the center of the task.

One important lesson for both designers of hypertext software and those who teach or write with hypertext appears in the problems encountered by the students with more computer skills. In relying too heavily on system

features, they implicitly made the assumption that the system, rather than the author, does most of the work. In doing so, they tended to ignore the stylistic and other author-created devices that made the search quick and easy for a majority of users.

We should also note that a preference for browsing up to and including the sense of "disorientation" can create disconcerting results for hypertext designers, despite the fact that hypertext theorists often praise this approach to wandering through a database. For example, one user criticized one of the systems precisely because it proved "more difficult to become disoriented in the good way that Intermedia and Storyspace tend to facilitate. I found that links continually brought me back to crossroads or overviews, rather than to other documents. For this reason I felt less like an active reader. Orientation devices such as these explained and categorized links rather than allowing me to make my own connections and categories" (AM). To those who find disorientation a negative quality, these comments might seem puzzling, because apparently negative qualities here come in for praise. In fact, this student specifically mentions "the good way" Intermedia and Storyspace create a sense of disorientation, which she takes to be a condition that empowers hypertext users because it places them in an active role—one particularly appropriate to this new information medium.

The reactions of these student-evaluators suggest six points about reader disorientation. First, although it represents a potentially significant problem in some systems, a priori concerns about it may well arise from lack of experience with hypertext systems, specifically from attempting to apply reading and information-retrieval protocols appropriate to book technology to this new medium.

Second, what one reader experiences as disorientation, another may find pleasurable.

Third, disorientation has quite different connotations in the writings of those based in technological as opposed to literary disciplines. The technologically based conception of disorientation relates to a conception of education essentially limited to factual information. Literary or humanistic assumptions about disorientation seem related to a conception of education in which students learn to deal with complex matters of interpretation.

Fourth, disorientation—let me emphasize this point yet again—arises both in the normal act of reading difficult material *and* in poorly designed systems. Knowledge of content, as some of our evaluators demonstrate, has to be considered as part of any solution to issues of system-generated or system-permitted disorientation.

Fifth, since for the foreseeable future, book and electronic technologies will exist together, in some applications supplementing, in others competing with, each other, designers of hypertext systems will continue to find themselves in a terribly difficult situation. Systems they design will almost certainly encounter a heterogeneous pool of users, some still trying to read according to the rules of books, others, increasingly sophisticated in electronic media, who find the specific qualities of hypertext reading and exploration, including occasional "disorientation," as pleasurable, desirable qualities.

Sixth—and most important—writing, as much as system design, as much as software, prevents the less pleasant forms of disorientation. We must therefore develop a rhetoric and stylistics of hypertext writing.

The Rhetoric and Stylistics of Writing for E-Space; or, How Should We Write Hypertext?

Linking, by itself, is not enough. The hypermedia author cannot realize the enormous potential of the medium simply by linking one passage or image to others. The act of connecting one text to another fails to achieve all the expected benefits of hypermedia and can even alienate the user. On the briefest consideration, such a recognition will hardly surprise, since authors of print essays, poems, narratives, and books do not expect to *write* merely by stringing together sentences and paragraphs without the assistance of stylistic devices and rhetorical conventions. If to communicate effectively, hypermedia authors must employ devices suited to their medium, two questions arise. First, what are the defining characteristics or qualities of hypertext as reading and writing medium? Second, to what extent do they depend on specific hardware and software? What effect, for example, does the presence or absence of color, size of one's monitor, and the speed of one's computer have on reading hypertext?

Then there are questions less immediately derived from the hardware. Assuming that writing at the level of phrase, sentence, and paragraph will not change in some fundamental way—and this, I admit, may be too large an assumption to make at this stage—what new forms of organization, rhetoric, and structure must we develop to communicate effectively in electronic space? In other words, if hypertext demands a new rhetoric and a new stylistics, of what do they consist, and how, if at all, do they relate to issues like system speed and the like?

To begin, let us look once again at the nature of the medium. I have just written that "hypertext changes the way texts exist and the way we read them,"

and in earlier chapters we have observed many examples of such difference from chirographic and print textuality. Whether or not it is true that the digital word produces a secondary or new kind of orality, many of the devices required by hypertext appear in oral speech, just as they do in its written versions or dialects. Many of these devices to which I wish to direct our attention fall into a single category: they announce a change of direction and often also provide some indication of what that new direction will be. For example, words and phrases like in *contrast, nevertheless,* and *on the other hand* give advance notice to listeners and readers of something, say, an instance or assertion, is coming contrary to what has come before. *For example* announces a category shift as the discourse switches, most likely, from general or abstract statement to proposed instances of it. Causal or temporal terms, such as *because* or *after,* similarly ready listeners for changes of intellectual direction. In both print and oral communication, they are means, in other words, of preparing us for breaks in a linear stream of language. One must take care in using this term *linear* since, as we have already seen when looking at hypertext narrative, all experience of listening or reading in whatever medium is in an important sense linear, unidirectional. Thus, although readers—or, to be precise, *readings*—take different paths through *afternoon, Patchwork Girl,* or *Quibbling,* each path—each experience of reading—takes the form of a sequence. It is the text that is multisequential, not a particular reading path through it. I emphasize this obvious point because the problem of preparing for change of direction (and openings and closings are also such changes) has been with us since the beginnings of human language.

Since hypertext and hypermedia are chiefly defined by the link, a writing device that offers potential changes of direction, the rhetoric and stylistics of this new information technology generally involve such change—potential or actual change of place, relation, or direction. Before determining which techniques best accommodate such change, we must realize that, together, they attempt to answer several related questions: First, what must one do to orient readers and help them read efficiently and with pleasure? Second, how can one help readers retrace the steps in their reading path? Third, how can one inform those reading a document where the links in that document lead? Finally, how can one assist readers who have just entered a new document to feel at home there?

Drawing on the analogy of travel, we can say that the first problem concerns *orientation* information necessary for finding one's place within a body of interlinked texts. The second concerns *navigation* information necessary for making one's way through the materials. The third concerns *exit* or

departure information and the fourth *arrival* or *entrance* information. In each case, creators of hypermedia materials must decide what readers need to know at either end of a hypermedia link in order to make use of what they find there. The general issue here is one of interpretation. More specifically, to enable visitors to this new kind of text to read it pleasurably, comfortably, and efficiently, how much interpretation must the designer-author attach to the system as a whole, to link pathways, and to documents at the end of links?

Unfortunately, no analogy maps reality with complete accuracy. Navigation, the art of controlling the course of a plane or ship, presupposes a spatial world, but one does not *entirely* experience hypertext as such. In navigation, we remember, one must determine one's spatial position in relation to landmarks or astral locations and then decide on a means of moving toward one's goal, which lies out of sight at some spatial distance. Because it takes time to move across the separating distance, one also experiences that distance as time: one's ship lies so many nautical miles and therefore so many days and hours from one's goal. The reader, however, does not experience hypertext in this way. The reader of *Paradise Lost*, for example, experiences as equally close the linked parts of Homer and Vergil to which the poem's opening section allude and linked lines on the next page or in the next book (see Figure 12). Because hypertext linking takes relatively the same amount of time to traverse, all linked texts are experienced as lying at the same "distance" from the point of departure. Thus, whereas navigation presupposes that one finds oneself at the center of a spatial world in which desired items lie at varying distances from one's own location, hypertext (and other forms of addressable, digital textuality) presupposes an experiential world in which the goal is always potentially but one jump or link away.

General Observations. Hypermedia as a medium conveys the strong impression that its links signify coherent, purposeful, and above all *useful* relationships. From which follows that the very existence of links conditions the reader to expect purposeful, important relationships between linked materials. One of the presuppositions in hypertext, particularly when applied to educational uses, is that linking materials encourages habits of relational thinking in the reader. Such intrinsic hypermedia emphasis on interconnectedness (or connectivity) provides a powerful means of teaching sophisticated critical thinking, particularly that which builds on multicausal analyses and relating different kinds of data. But since hypermedia systems predispose users to expect significant relationships among lexias, those that disappoint these expectations tend to appear particularly incoherent and without significance.

When users follow links and encounter materials that do not appear to possess a significant relation to the document from which the link pathway originated, they feel confused and resentful. In reading materials on the Web, the delays encountered by users tend to exaggerate this effect, thus providing another reason for avoiding time-consuming graphic or other elements whenever possible if one wishes to include an audience without high-speed access to the Internet.

System-Generated Means of Reader Orientation. Devices of orientation permit readers (1) to determine their present location, (2) to have some idea of that location's relation to other materials, (3) to return to their starting point, and (4) to explore materials not directly linked to those in which they presently find themselves.

The graphic presentation of information embodied in the useful, if limited, desktop metaphor proves an especially effective means of reader orientation in the systems that use them, but World Wide Web browsers, in which the risks of disorientation are particularly grave, do not. Of course, the "Show Location" window in IE, Firefox, Safari, Netscape, and other HTML browsers does provide the exact address of a lexia, and as I write today, following a link to one student's essay on *Patchwork Girl*, say, Lars Hubrich's "Stitched Identity," would produce the following information in the location window: http://www.cyberspaceweb.org/ht/pg/lhpatch.html. Such information not only appears in a form daunting to most readers, it fails to be very helpful on two counts: first, the need to create economically brief directory names often renders the file incomprehensible to all but the person who maintains a website and, second, it provides very little information about the relation of this particular lexia to the information space it inhabits.

One way of providing the benefits of graphic presentation of a folder structure takes the form of Java applets, such as those created by Dynamic Diagrams for IBM's website (Figure 13), which generate an animated three-dimensional image of an individual lexia's location within a file structure. Where such software solutions are not available, authors have employed two solutions. One involves organizing an entire site according to what is essentially a folder structure and then making that organization clear. Thus, Susan Farrell's *Art-Crimes*, a site containing graffiti from around the world, presents its information in terms of country, city, and additional collections for each city. Of course, this beautiful site, which provides a visual archive, has little intrinsically hypertextual about it and therefore cannot serve as an example for other kinds of webs.
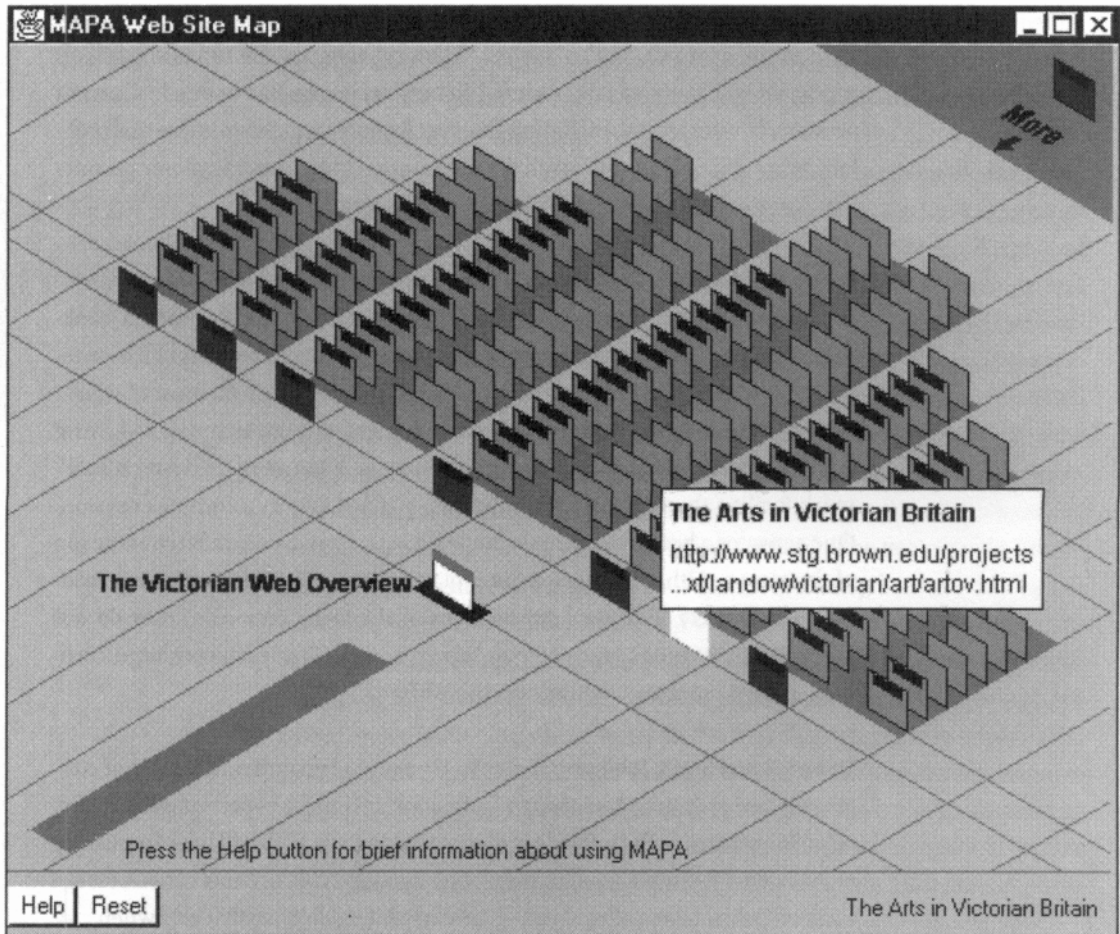
Figure 13. A View of *The Victorian Web*. This map was created by Dynamic Diagrams MAPA from the vantage point of this web's homepage (main sitemap or overview). In this screen shot, a user has activated a pop-up window displaying the URL and title of "The Arts in Victorian Britain," a second-level overview. By using a computer mouse to move the cursor farther away from the top level, users can also learn the titles of lexias linked to this and other overviews. Double clicking on the icon for any lexia opens it. (Copyright 1996 Dynamic Diagrams. Used by permission.)

Keeping (the) Track: Where've I Been, What Did I Read? In addition to helping readers discern their general location within an information space at any moment, systems also have to provide both some means of informing them from whence they came and a means of allowing them to return. As one of its functions, the Roadmap in Storyspace provides a sequential list of lexias that one has visited and provides a slightly cumbersome means of returning

to any one. Web browsers also have means of providing current reading history: mousing down on the "Go" or "History" menu at the top of the screen produces a chronologically ordered list of lexias one has opened.[2] Current versions of webviewers, including Internet Explorer and Safari, solve this problem by retaining lists of the web documents one has visited; Explorer permits the user to specify how many sites should be retained.

Another valuable orientation tool takes the form of permanent bookmarks in World Wide Web browsers, a feature anticipated by HyperCard-based systems like Voyager Expanded Book, Keyboard, and Toolbook. Such a bookmark function permits readers to record places to which they might like to return at some future time, and when designing large websites, most of whose links remain internal, authors can advise readers who contemplate following links to materials offsite that they might first wish to use their viewer's bookmark facility, thus making return easier, particularly in a complex session. One activates a bookmark simply by choosing it from a list available at the top of the screen. Although these devices play an important role in allowing readers to customize their own experiences of the webs they read, they do not compensate for the absence of long-term reading histories in very large, complex corpora, such as one finds on the Web.

Dynamic and Static Tables of Contents. One often encounters the table of contents, a device directly transferred from book design, in hypertext documents, often to very good effect. Readers of materials on the Web will have frequently encountered it since a good many homepages and title screens consist essentially of linked tables of contents. I have used it myself, particularly when creating hypertext versions of print materials, a subject I shall discuss at greater length in a separate section below. The World Wide Web version of the opening chapter of the first version of this book, for instance, employs two such contents screens, one for the entire volume and a second for the first chapter, the only one available on the web. Although such a table of contents provides a familiar, often effective means of presenting a work's organization, in its static form it often overemphasizes the element of the electronic book to the detriment of its hypertextuality.

Electronic Book Technologies' DynaText, which features a dynamic, automatically generated contents screen, offers a much more powerful version of this device. DynaText uses text in the form of SGML, a far richer, more powerful older relation of the Web's HTML. Since SGML requires that one begin and end every chapter title, section heading, and all other text structures with specific tags (markup), DynaText employs this information to produce an

automatically generated contents screen, which authors and designers can arrange to appear a particular place on the screen. In *Hypertext in Hypertext,* the electronic version of this book's first version, this contents section appeared to the left of the main text.

This electronic table of contents differs in several ways from the static versions one encounters in the printed book and on the Web. First, clicking on an icon near the title of a chapter immediately causes the section headings next level down to appear, and clicking on them in turn displays subheadings, and so on. Essentially, this dynamic table of contents acts very much like Nelsonian stretchtext. Since I had added additional subdivisions to almost every section better to suit reading in an electronic environment, this feature permitted *Hypertext in Hypertext* to display both the book's original organization and the added elements as readers needed them. The second point at which Dyna-Text's dynamic contents screen differs from static ones is that clicking on any section immediately brings up the relevant section in the text window immediately to the right of the section title (Figure 14). Finally, because the designers of this system combined this feature with its full-text search engine, the results of a search appear in the contents screen as well as in the text itself. Searching for "Derrida," one learns that this name appears seventy-four times in the entire book, forty-three times in the first chapter, and five times in the first section of that chapter. This dynamic listing proves particularly valuable when a DynaText web is configured as an electronic book, for then following a link from one point in the text to another causes the destination text to replace the departure one. The system works so quickly—nearly instantaneously—that without the contents listing at the side, readers become disoriented.

Tables of contents, whether static or dynamic, certainly have their uses, particularly when hypertextualizing material originally conceived for print presentation. Linked static tables are already common in HTML, but one can also create some of the effects of the DynaText form by using HTML frames, placing the contents at the left and text at the right.

Suppose You Could Have Everything?—The Intermedia Web View and Some Partial Analogues. The most important Intermedia feature that current systems, particularly web browsers, lack is its system-generated dynamic tracking map, whose basic idea evolved through three stages. The first, the Global Tracking Map, provided graphic information about all links and documents in a particular body of linked documents. Clicking twice on the icon for a particular hypertext corpus, such as *Context32, Nuclear Arms,* or *Biology,* simultaneously activated that hypertext web—that is, opened it—and generated a

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Find: | derrida

Hypertextual Derrida, Poststructuralist Nelson? [pp. 2-3]

When designers of computer software examine the pages of *Glas* or *Of Grammatology* they encounter a digitalized, hypertextual Derrida; and when literary theorists examine *Literary Machines* they encounter a deconstructionist or poststructuralist Nelson. These shocks of recognition can occur because over the past several decades literary theory and computer hypertext, apparently unconnected areas of inquiry, have increasingly converged. Statements by theorists concerned with literature, like those by theorists concerned with computing, show a remarkable convergence. Working often, but not always, in ignorance of each other, writers in these areas offer evidence that provides us a way into the contemporary *episteme* in the midst of major changes. A paradigm shift, I suggest, has begun to take place in the writings of Jacques Derrida and

suppImnt - fulltext

⊟ The Johns Hopkins Guide to Literary Theory and Criticism

⊞ M. M. Bakhtin

⊞ Roland Barthes

⊞ Deconstruction

⊟ Jacques Derrida

Understanding and Misunderstanding Jacques Derrida

Contextualizing Derrida

⊞ Discourse

⊞ Poststructuralist Feminisms

⊞ Materialist Feminisms

⊞ Michel Foucault

⊞ Claude Lévi-Strauss

Understanding and Misunderstanding Jacques Derrida
Jean-Michel Rebaté

The difficulty of introducing a major contemporary philosopher such as Jacques Derrida (b. 1930) in a reference work presenting central issues of literary criticism is double, and this danger, this hesitation on the threshold, has already been systematically thematized in the writings of the philosopher himself. First, there is the danger of oversimplifying, of pigeonholing, of reducing, of defining artificial boundaries, when facing a movement of thought that constantly evolves so as deliberately to defeat and baffle all preordained categories. Then, there is the danger of being merely mimetic, of just repeating strategies and gestures that have been identified with a signature, with an author (and may well have been anticipated by other writers), and that tend to be singular, unrepeatable, yet endowed with universal validity. However, the possibility of bypassing such an initial aporia exists, and it consists in considering the fundamentally affirmative nature of Derrida's thought and writing rather than in stressing the "playful" or "negative" element of his textual practices.

This affirmative aspect seems to be confirmed by the more recent

Figure 14. The Dynamic Table of Contents in Electronic Book Technologies' DynaText. This system, which combines the features of an electronic book with hypertext linking, automatically generates a reconfigurable, linked table of contents from the SGML codes used to mark elements of a text, such as chapter and section titles. In this example from *Hypertext in Hypertext*, mousing down on the plus signs to the left of items in the table of contents immediately displays titles of subsections. Clicking on the subsection title immediately brings up the relevant section in the right-hand panel. The table of contents also reinforced DynaText's full-text retrieval functions: in this case, after a reader has typed in "derrida" (the search tool is not case-sensitive), DynaText both highlights all occurrences of the word throughout the text (*top center*) and lists the number of occurrences next to each chapter and section heading (*left*). Having observed that "Derrida" appears five times in the book's opening section, the reader has moved that section into view; noticing that "Derrida" appears in red ink, the sign of a link, the reader has then clicked once on that link and opened a second DynaText "book" at Jean-Michel Rabaté's "Understanding and Misunderstanding Derrida" from *The Johns Hopkins Guide to Literary Theory and Criticism*.

document in which icons representing each document in the web were joined by lines representing all links between documents. This Global Tracking Map, which functioned only during early stages of Intermedia's development, immediately demonstrated that such a device was virtually useless for all but the smallest document sets or webs. (Although pictures of it have appeared in articles on hypertext, the Global Tracking Map was never used educationally and was never part of any released version of Intermedia.) It is worth noting this failed approach because, according to the computer science literature, it seems to reappear again and again as a solution to orientation problems for the Web.

IRIS next developed the Local Tracking Map, a dynamic hypergraph whose icons represented the destinations of all the links in the current document. Upon opening a new lexia or activating a previously opened one, this graphic navigational tool morphed, informing readers where links in the new lexia would bring them. This dynamic hypergraph, which did much to prevent disorientation, became even more useful in its third and final version, the Web View, with the addition of two more features: a graphic representation of the reader's history and transformation of the icons into links. Double clicking on any icon in the Web View opened the document it represented, thereby adding another way of making one's way through webs. (For illustrations, see Utting and Yankelovich.)

Although this feature succeeded well in orienting the reader, it worked even better when combined with author-generated concept maps, such as the overviews (sitemaps) I have employed on systems including Intermedia, Interleaf World View, Storyspace, Microcosm, MacWeb, and the World Wide Web. One basic form of these overviews surrounds a single concept (Victorianism, Darwinism, Gender Matters) or entity (Gaskell's *North and South*, Dickens) by a series of others (literary relations, cultural context, economic background), to each of which many documents link. Whereas the Web View presented all documents attached to the entire overview, the overview has a hierarchical organization but does not reveal the nature or number of documents linked to each block. Intermedia provided two ways of obtaining this information—a menu that following links from a particular link marker activated the Web View (see Figure 8). Clicking on a particular link and thus activating it darkened all the links attached to that block in the Web View. Thus, working together, individual documents and the Web View continually informed the reader what information was one jump away from the current text. This combination of materials generated by authors and system features well exemplifies the way hypertext authors employ what are essentially

stylistic and rhetorical devices to supplement system design and work synergistically with it.

These features of this no-longer available system solved the basic problem of orienting readers. Unfortunately, current World Wide Web browsers are very disorienting because they provide no overall view of materials and neither do they indicate to readers where links will take them. The use of sitemaps, HTML documents that list or graphically display destinations of links, have greatly contributed to web usability, and many sites now include them (see Kahn and Krzysztof, *Mapping Websites*).

Various research and commercially available systems have had partial analogues to the Intermedia Web View. One research version of the University of Southampton Microcosm system, for example, had something very like the local tracking map, but it was not implemented in the released version, and Storyspace, a commercially available system, has its Roadmap, which has many of the Web View's functions (Figure 15). Like the Web View, the Roadmap records one's reading path, shows linked lexias, and permits one to open them; unlike the Web View, the Storyspace device also lists all links coming into the current lexia. Unfortunately, the Roadmap, which takes the form of a menu containing scrollable lists, lacks the Web View's dynamic quality, for it does not run continuously and has to be opened from a menu or by means of a key combination for each individual document.

Intermedia's dynamic hypergraph proved so valuable as a means of orientation and navigation that I hope someone will develop an equivalent application either as part of widely used World Wide Web viewers or as an add-on that will function with them. Certain steps have already been taken in that direction. The University of Heidelburg's Hyper-Tree, for example, offers graphic representations of the file structure of individual servers, but, unfortunately, like the first Intermedia attempt to graph links, it provides too much information, thus rendering it of little practical use. The Touchgraph Google Browser (Figure 16),which is more selective, draws on search results from Google to map what it takes to be the most popular connections between the lexia (or entire website) whose URL the user provides and other lexias within and without the site, producing results quite different than a sitemap or overview. The Touchgraph for *The Victorian Web's* "Religion in England" sitemap (Figure 16) has only a few of the dozens of the documents on religion, such as "High Church: Tractarianism" and "The Broad Church Party," but it omits perhaps the most important, heavily linked document on religion in *The Victorian Web*, the essay on the Church of England. Interestingly, it reveals a close connection between religion and British art and, rather unexpectedly,
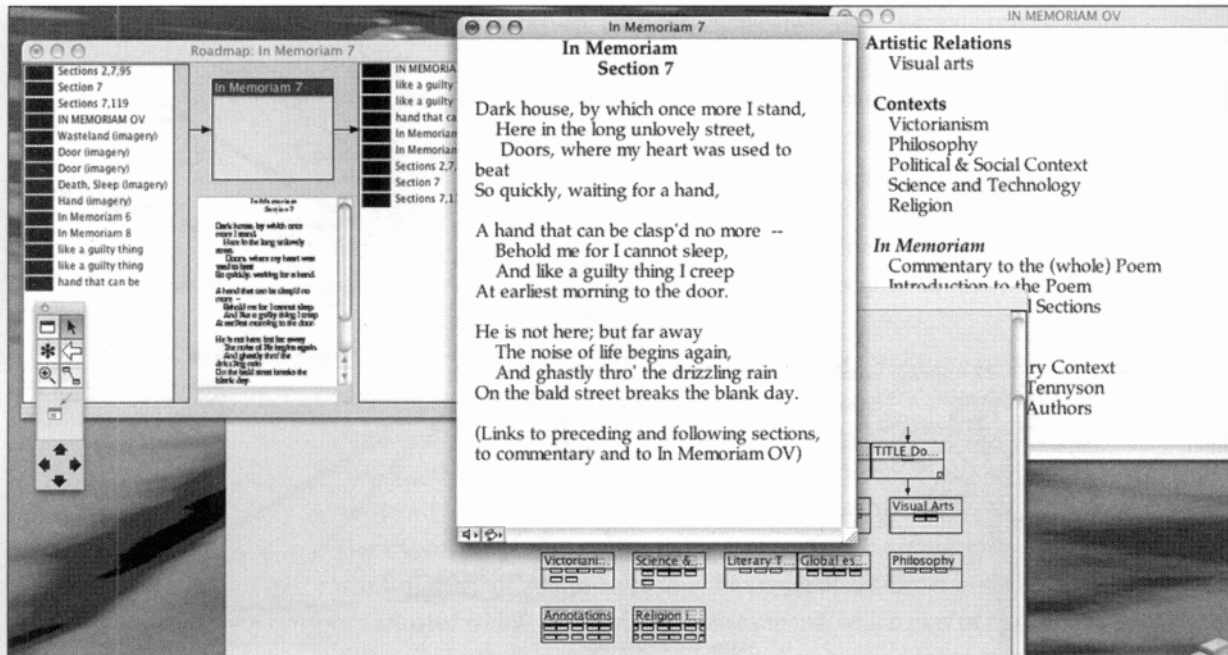
Figure 15. The Storyspace Roadmap Feature. The Roadmap (*upper left*) represents a static analogue to the Intermedia Web View. At the top center of the Roadmap appears one's reading history and, immediately below it, the first few lines of the currently active lexia. Like the Web View, the Roadmap informs readers of possible destination lexias and permits readers to open them directly, but unlike the Intermedia tool, which displayed only destination lexias, the Roadmap displays all links in and out of the current lexia. Unfortunately, whereas the Web View always remained in sight and automatically reconfigured itself as each new document opened, the Roadmap appears only on demand and has to open each document separately.

Lewis Carroll has a major presence. This diagram also contains off-site lexias, and whereas the *Artcyclopedia* essay on D. G. Rossetti might be expected, since the Pre-Raphaelites appear repeatedly, I'm intrigued by the outlying "Virtual Tour of Brasenose College." A similar Touchgraph for Charlotte Brontë, which is much denser, includes a substantial number of obvious external sites on the Brontës, Derbyshire, and other women writers, but I am mystified by the presence (occupying the diagram's entire upper-left quadrant) of a concentration of materials on the Harlem Renaissance, including the Red Hot Jazz Archive. The Touchgraph for *The Victorian Web*, which is too dense to reproduce effectively, makes many obvious connections to external sites and quite a few unexpected ones, too. The very fact that so many unexpected connections appear in these diagrams makes them quite fascinating,
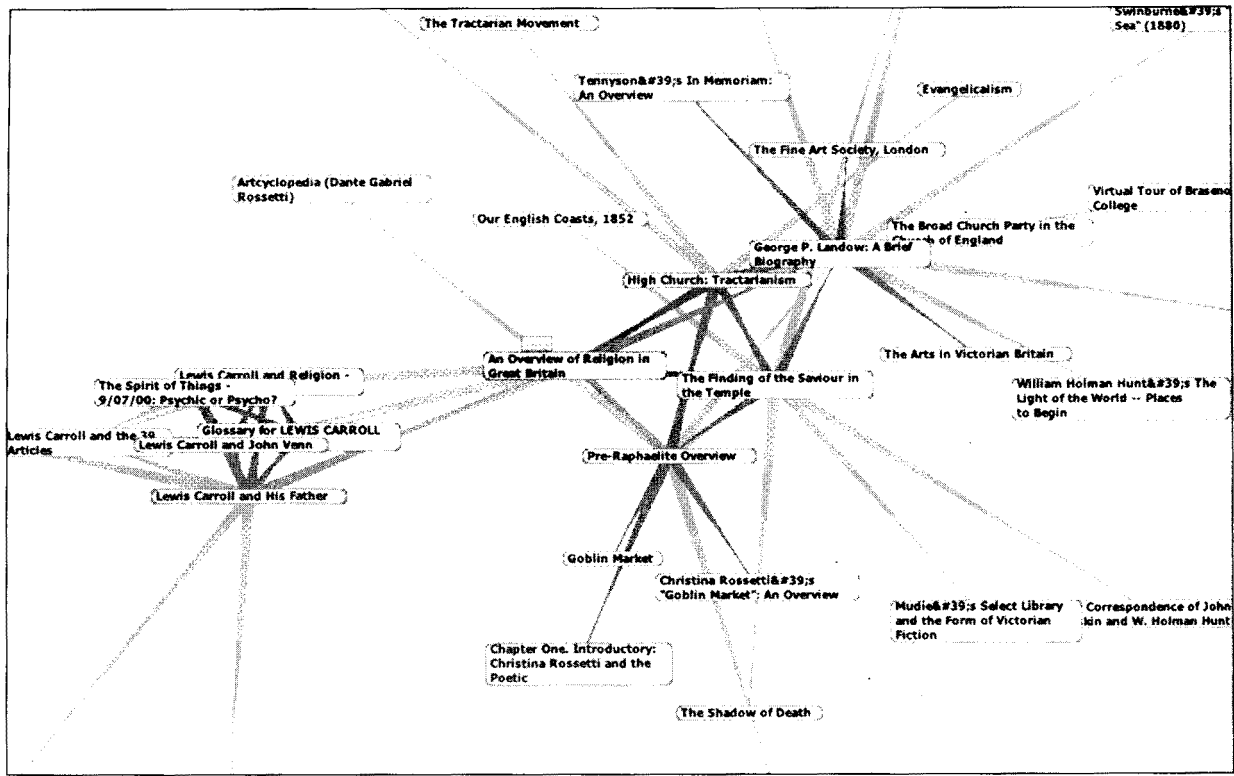
Figure 16. The Touchgraph Google Browser. This software draws upon search results from Google to map the most popular connections between an individual lexia or entire website whose URL the user provides and other lexias within and without the site. Its results, which differ markedly from an author-created sitemap or overview, often reveal unexpected relationships among websites.

and I can see a value in either including a few screenshots to show readers some interesting connections or linking to the Touchgraph site, so they can explore for themselves. The Touchgraph approach shows, however, the shortcomings for our purposes of mapping a website according to popularity (most visited and linked-to lexias): the resulting diagram omits one of the most valuable characteristics of hypermedia—its capacity to support individual, even idiosyncratic, approaches to information.

Author-Created Orientation Devices: Overviews. As the Web View and Roadmap show, readers need effectively organized preview functions—what Mark Bernstein terms "airlocks"—that show them what lies one jump away. In the next section I shall suggest stylistic, rhetorical techniques that hypertext authors can employ in the absence of such software tools. Some hypertext

systems like Microcosm, Storyspace, and Intermedia provide several means of helping orient the reader; others provide little built-in assistance to solving basic problems of orientation. But whatever system authors employ, they should use overview and gateway documents, which are devices entirely under their own control. Overviews or sitemaps, which can take many forms, are author-created (as opposed to system-generated) documents that serve as directories to aid in navigating the materials. Overviews assist readers to gain convenient access to all the materials in many documents or to a broad topic that cuts across several disciplines.

Overviews or sitemaps take six forms, the first of which is a graphic concept map that suggests that various ideas relate to some central phenomenon or impinge on it. This center, the subject of the overview, can be an author (Tennyson, Darwin), chronological or period term (eighteenth century, Victorian), idea or movement (realism, feminism), or other concept (biblical typology, cyborg). The implied and often reinforced message of such arrangements is simply that any idea that the reader makes the center of his or her investigations exists situated within a field of other phenomena, which may or may not relate to it causally. Such graphic presentation of materials depicts one informing idea or hidden agenda of hypermedia materials, namely, that one proceeds in understanding any particular phenomenon by relating it to other contexts.

These kinds of overview lexias, which I have used since the first days of Intermedia, have particular value for the World Wide Web, which tends toward a flattened form of hypertext. Their emphasis on multiple approaches simultaneously provides a way of breaking out of the implied page format that confines the Web and also of creating what Paul Kahn has termed a "crossroads document," a point to which the reader can return repeatedly and before departing in new directions. The various websites I maintain use different kinds of overviews. *The Victorian Web* surrounds a central image by a range of related topics. In that for Elizabeth Gaskell's *North and South,* for example, a linked icon for political and social context appears at the top center, and immediately beneath comes those for biography, other works by the same author, Victorianism, and women's lives (Figure 17). The icons for literary relations and visual arts flank the image representing the novel. In the line below are five icons representing aspects of technique—setting, symbolism, characterization, narration, and genre; centered beneath them appears that for religion and philosophy.

Although one could use a single image map for such an overview on a website, using separate icons has some advantages, the first of which is that by using the "Alt" option in HTML that permits one to include a text label,
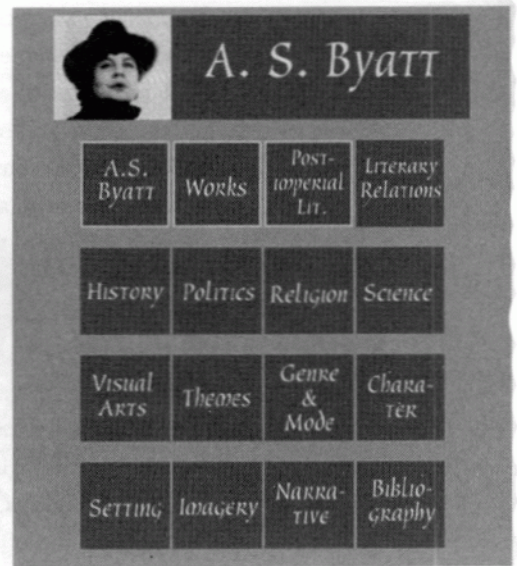
Figure 17. Two World Wide Web Overviews. These examples show two different approaches to creating overview lexias for the World Wide Web. That on the left, the overview for Elizabeth Gaskell's *North and South* in *The Victorian Web*, represents the latest version of the Intermedia-style overviews, which emphasize that readers can approach a subject from multiple points of view. The A. S. Byatt overview, in contrast, presents a similarly nonhierarchical approach to organizing information, by arranging its linked headings in a series of horizontal rows. This approach to creating overviews with HTML (text) documents has several advantages over image maps: (1) this text-based overview loads (opens) faster than server-based image maps; (2) since Internet Explorer, Safari, Netscape, and other web browsers retain images in a cache, building different overviews with the same elements creates documents that load very quickly; (3) such overviews are easily modified by adding or subtracting individual icon-and-link combinations; (4) these overviews have the advantage of employing the same files for both overviews and footer icons, thus reducing storage space and access time.

these kinds of overviews will work with old-fashioned browsers that do not have graphics capacities—an important consideration when portions of one's intended audience may not have the kind of computer access or equipment needed to handle large images. Moreover, one may create standard templates for all the overviews in a particular web, thus producing a kind of visual consistency, and yet one can easily modify appropriate elements. In the Gaskell overview, for instance, "Works" replaces "Other Works," and in those for other texts other icons appear, including those for themes, bibliography, related World Wide Web materials, and so on.

Figure 18. Gunnar Liestøl's *Kon-Tiki Interactive:* **The Introductory Overview. This interactive overview surrounds an image of the globe with seven circular images, representing Thor Heyerdahl and six of his expeditions. These images serve as icons, previews, and conceptual overviews. Clicking on any one of them halts sound and animation and opens an interview for the subject it represents. (Used by permission of Gyldendal Publishers.)**

Gunnar Liestøl's *Kon-Tiki Interactive,* which I shall discuss in more detail below, surrounds an image of the globe by seven circular images, each of which animates in turn, Thor Heyerdahl and six of his expeditions (Figure 18). Not all the overviews that wish to avoid hierarchy or linearity need to have this kind of circular format. Unlike the Liestøl and *Victorian Web* overviews, those for the hypertext section of *The Cyberspace Web* and all materials in the Postcolonial Literature Web do not emphasize centrality. Instead, taking the

A. S. Byatt Overview as an example, we find the topic of the document above three rows of five square icons each (see Figure 17). This arrangement, which also avoids the linearity of a table of contents, has the advantage of permitting one to employ some of the same icons both in overviews and at the foot of each screen.

Chronologies represent another form of sitemap or overview, which one can easily create using two-column tables in HTML. They offer a means of clearly organizing materials or even entire courses that have a strong chronological orientation. Any timeline with links in fact serves as an overview for the materials it joins. Although timelines provide a means of organization particularly convenient to authors, remember that they may simplify complex relationships and do little to compel the interest of a reader unacquainted with the subject.

Images of natural objects, like the photograph of a cell or maps, provide a kind of naturally occurring concept map that authors can easily apply. Attaching links to labels in technical diagrams similarly provides an obvious way of enriching conventional information technology. These kinds of overviews, incidentally, exemplify a perfect use for World Wide Web image maps. Perhaps my favorite is a map of Italy showing major Italian websites: click on the tiny square representing a particular city, and a link takes you to its website.

If hypermedia is characterized by connectivity, to realize its potential one must employ devices that emphasize that quality. Lists, tables of contents, and indices, though still of significant use, do not work in this manner, but one may wish to use them in addition to other kinds of graphic organizing devices, as does the elegant *Kon-Tiki Interactive* CD-ROM, which parallels its circular overview with an interactive outline. Mousing down on its individual elements, say, that for the Kon-Tiki itself, produces a list of eleven items (Figures 19–20).

When converting text documents originally created for book technology for presentation on hypermedia, one may occasionally use the document itself as its own overview. Any document in a hypermedia system with more than a few links in essence serves as a sitemap since, once opened, it provides the immediate center and reference point for the reader's next act of exploration. The author of educational materials, particularly those involving literary texts or those that place primary emphasis on the details of a text, may therefore wish to take advantage of this quality of hypermedia. Section 7 of *In Memoriam* (see Figure 9) exemplifies a brief text document that functions as its own overview or sitemap in a Storyspace web, and each section of the heavily annotated HTML version of "Hudson's Statue" by Carlyle func-
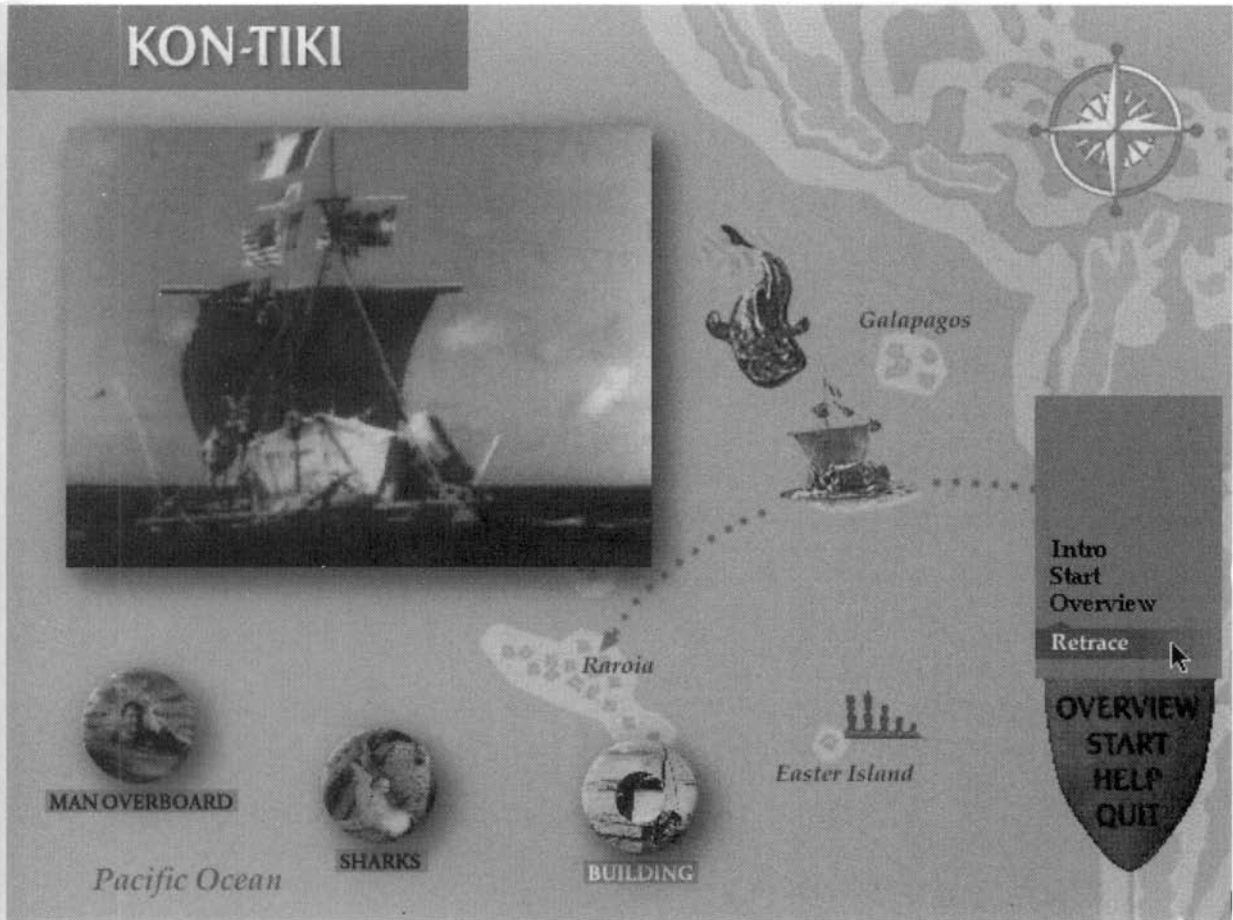
Figure 19. The Help Function in the Kon-Tiki CD-ROM. Moving the mouse near the ray stone shield halts all sound and video while simultaneously revealing a menu of choices. (Used by permission of Gyldendal Publishers.)

tions in the same manner. One must take care not to overdo this kind of heavily linked text document on the Web, which has few orienting devices, since linked text alone does not always provide very clear indications of where its links take the reader. In a scholarly or critical presentation of a text, such as the Pepys's *Diary* Weblog or "Hudson's Statue," in which the links clearly take one to annotations and commentary, these heavily linked lexias can function in this way, in large part because the nature of the document indicates the kind of links that will attach to it. In contrast, some heavily linked opening screens of personal sites on the Web, though occasionally amusing, often appear completely chaotic.

OVERVIEW

Start
Help
Museum
Credits

Thor Heyerdahl
Kon-Tiki ▶
Galapagos ▶
Easter Island ▶
Ra I & II ▶
Tigris ▶
Tucume ▶

Man overboard
KT navigat...
Construction
Provisions
Life on board
Flying fish
Sharks
Whale shark
Wireless
Aftermath
Snake fish
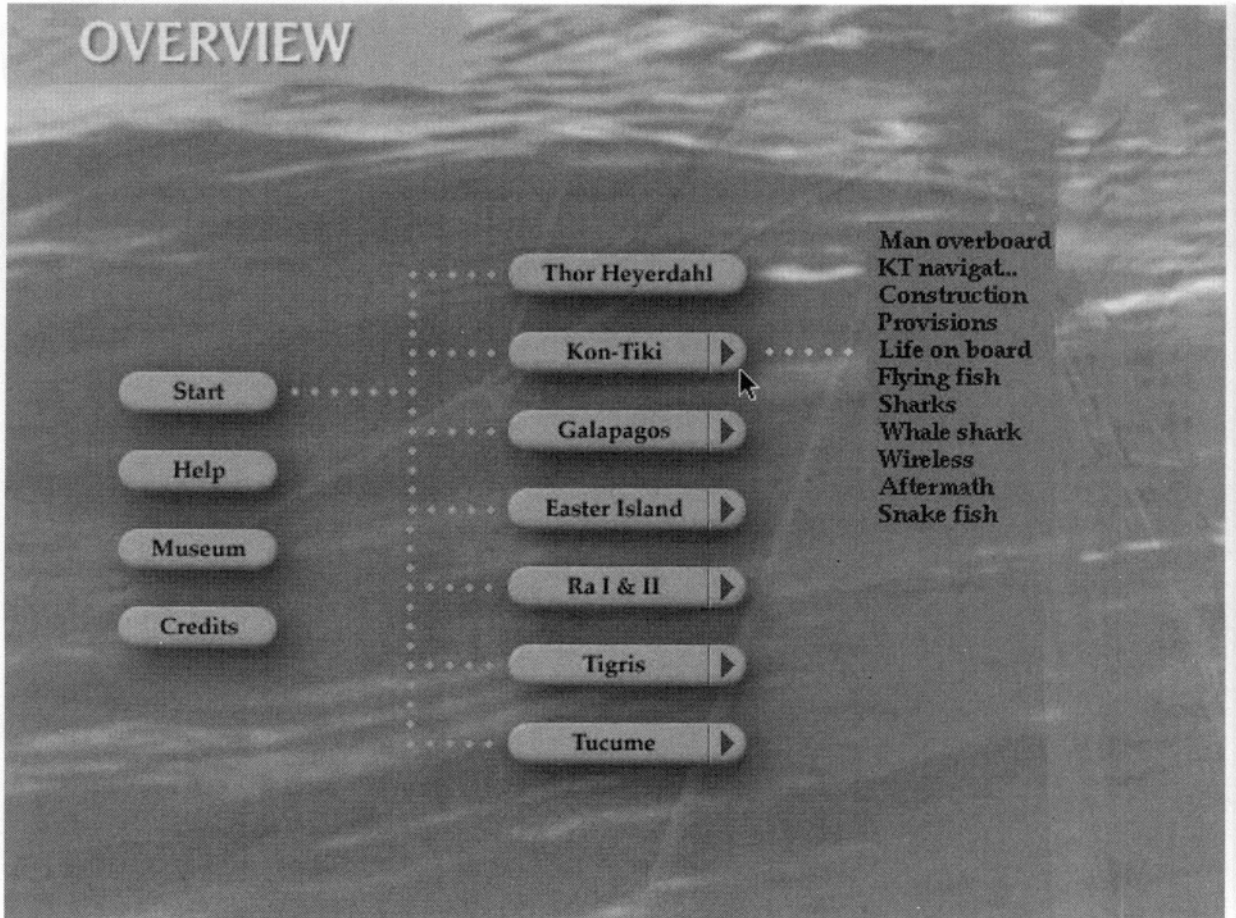
Figure 20. Kon-Tiki Overview. Selecting any item in this interactive overview produces a sublist of items. (Used by permission of Gyldendal Publishers.)

Whatever kind of overviews or local sitemaps one chooses, one should accommodate—and encourage—different styles of hypertext reading by providing as many as is convenient for each subject, and one should also expect that individual lexias, particularly in information hypertexts, will link to multiple overviews. Thus, an essay comparing women's issues in Graham Swift's *Waterland* and A. S. Byatt's *Possession* would link to the literary relations document for each work but also to those for themes, gender matters, and techniques as well.

Closely related to overviews and directories are those documents that serve as gateways between courses or bodies of materials in separate disciplines.

Such gateway lexias are particularly useful on the World Wide Web when a link brings the reader from the present website to another. The most common form of such gateways appears in the separate documents containing lists of links to other websites. Another example of such a transitional lexia is *The Victorian Web*'s brief introduction to the University Scholars Program (USP), National University of Singapore, which funded several postdoctoral and senior research fellows whose work appears on the site. As a means of identifying their work, icons representing the USP appear throughout *The Victorian Web*. Instead of linking these icons directly to the USP site, which would confuse readers—who might wonder, "Why am I reading about Singapore?"—I have linked them to a lexia that describes the USP and its role in supporting the site; links within that lexia then bring anyone who wants to know more about the USP to its homepage. Even within a small section of a single website, such as that formed by materials on a single author, concept, or event, such introductory transitional lexias prove useful. For example, when creating links from an icon or subject heading for one author's relation to other writers, one can either link to a local sitemap listing all relevant essays or one can link first to a general introduction; this latter approach works particularly well as a means of introducing complex relations not evident from a sitemap or of indicating a special concentration of materials in one area.

Gleamware. In addition to describing some effective software solutions to meet the needs of the hypertext author, permit me to propose something like a wish list. Computer users often refer to promised projects as so much vaporware, meaning that a product or research project that someone has presented as already existing is in fact little closer to reality than a plan or a promise. Let's go even farther back—from promise to desire. When I was much younger, I remember hearing the expression that mentioned a time when someone "was just a gleam in" their eyes of their parents. Let us consider gleamware or wishware.

Such an example of gleamware would be semiautomatically generated sitemaps and crossroads documents in HTML that would permit reader-authors on the Web to produce such intermediary documents by combining complex searches with elegant templates. At the moment of writing, no World Wide Web browser has the one-to-many linking that I believe so crucial to creating a fully multiple hypertext. Therefore, to translate materials originally created in systems that have such linking or to emulate them, authors find themselves forced to expend an enormous amount of time and effort manually creating—and maintaining—link menus. The implications

of such difficulty will become clear when I report that the multiple links that required twenty to thirty minutes to create for an Intermedia or Storyspace overview—and less than half that time for Microcosm, using its more sophisticated generalized link-options—can take several days when translating such materials for the Web: one must go through the subset of documents that will link to the overview and manually create separate ones for literary relations, themes, biographical materials, and so on. Even if one already has an earlier version of one's materials in another software environment to remind one of possible links, it still takes hours of repetitive work—with the result that authors inevitably tend to avoid as much of it as possible and thereby produce a relatively flattened hypertext.

So here's my first two gleamware proposals, the first of which may already exist as a proprietary research tool in some large corporations in the computer industry. Imagine combining Macintosh OS 10.4's Spotlight feature or a commercially available search tool, such as On Location, with some C-programming, and a set of templates that would permit one to generate with minimum expenditure of time and effort a suboverview entitled, say, "Political Themes in Dickens" simply by calling up a menu and typing "Dickens," "themes," and "politics." An even better version—one that I have spoken about longingly since the last few years of the Intermedia project—involves automatically generated graphic representations of literary and other complex relations. In this example of gleamware, one would simply choose from a menu a literary relations (or similar) option, and one's authoring (reading?) system would combine a graphics engine, search tools, resulting indices, glossaries, chronologies, and synonym lists to produce automatically the kind of concept maps Paul Kahn created in the early *Dickens Web:* using synonym lists and chronologies, this Relations Map Generator—let's give it a properly stuffy name—places the chronologically earlier authors or texts toward one end of a chosen axis; earlier ones could appear, for example, at the left, at the top, or, in a three-dimensional representation, farther away. Authors or texts that I considered more important—either for reasons of some cultural standard (Shakespeare), relation to the author in question (Hallam to Tennyson, the Brownings to each other), or quantity of available commentary could be made to appear larger or in brighter colors. You get the idea. Let's take the gleam one step further: if one could produce such documents quickly enough—something that probably assumed preexistent indices—such documents could exist only dynamically, created each time one followed a link from an overview, and hence always current, always up-to-date.

Author-Created Orientation Devices: Marking the Edges. In the absence of such tools, what kinds of techniques can one use to assist readers? One device especially important to those creating materials in HTML involves using visual indications of a lexia's identity, location, and relation to others. These signals can take the form of header icons, color schemes, background textures, linked icons that appear at the foot of lexias, or all in combination. Such devices play a crucial role on the Web, where readers may arrive at any document via a search engine, entering at what could be the middle of a planned sequence or set of documents. Without some such device even readers who find that a particular arrival lexia meets their needs and taste become frustrated because they cannot conveniently determine whether it forms part of a larger structure.

One of the most commonly used such devices is the header icon, which immediately informs the reader that a lexia belongs to a particular web or subweb. For example, in *The Victorian Web* a blue-and-white header element appears immediately following the lines providing title and author. At the left of this icon, which is a third of an inch high and 7 inches wide, appears a black-and-white image of Queen Victoria followed by the words "The Victorian Web" and a white line extending the remaining length of the header. Using an editor, such as Dreamweaver or BBEdit, which permits easily making global changes—that is, changing all occurrences of a word or phrase in an entire set of documents rather than having to do them one at a time— makes inserting such elements extremely easy to do. Whereas *The Victorian Web* employs a single header icon, some of the other websites I maintain, such as that on recent postcolonial literature, uses a different one for each major division or subweb. This second web has separate sections for anglophone literature of Great Britain, the Indian subcontinent, Africa, and Australia and New Zealand, and therefore employs different headers as well as other devices for each section. Similarly, Adam Kenney's *Museum,* a Web version of anthology-fiction like *The Decameron,* organizes itself around a series of individual narrators and uses an image at the top center of each lexia to identify different narrative arcs.

Other devices include color schemes as well as background textures, and combined with footer icons they make an effective means of simultaneously orienting the reader while indicating the permeable borders of both the lexia and the larger units to which it belongs. For example, an essay from *The Victorian Web* that compares the railway swindlers in Trollope's *The Way We Live Now* and Carlyle's "Hudson's Statue" has five footer icons, one for the main

Victorian overview followed by one each for Trollope, his novel, Carlyle, and his text (Figure 21). The first three icons denote increasing specificity, thus indicating that the document contributes to the web as a whole, to those materials concerning Trollope, and to those about this particular novel. In contrast, the five icons, taken together, indicate that the lexia in question simultaneously participates in two subwebs or directories. These icons thus serve to orient readers by clearly stating how the lexia in which they find themselves relates to one or more large categories—in this example, five separate ones.

Furthermore, because links attach to each of these icons, clicking on them brings readers to a sitemap for these larger categories. Attaching links to the icons, in other words, makes them devices of navigation as well as orientation. In one sense these devices mark the edges of one or more groups or categories to which the lexia belongs or with which it associates, but the most important function involves not so much delimiting an edge or border of a document as indicating its relation to, or membership in, one or more subwebs. The effect of this congeries of devices, therefore, is to orient readers who find themselves in a particular lexia by clearly indicating its relation to others, its (intellectual) place within a web.

This combination of headers, color schemes, and linked footer icons works particularly well in large or particularly complex collections of interlinked lexias, such as those created by participants in courses or departments. The *Cyberspace and Critical Theory* web, for example, contains not only course materials and links to many websites external to Brown but also to a collection of elaborate individual student projects, some consisting of more than one hundred lexias and graphic elements. In this situation such identification and bordering schemes prove particularly useful because they inform readers that they have arrived at a discrete document set. Following a link from the print section of the information technology overview brings one to Amanda Griscom's *Trends of Anarchy and Hierarchy: Comparing the Cultural Repercussions of Print and Digital Media,* her World Wide Web translation of a substantial honors thesis comparing the seventeenth-century pamphlet wars in England and the periodical press that succeeded them with the situation on the Internet today. In contrast to the black background and white and yellow text of the Infotech overview, *Trends of Anarchy* confronts the reader with a pale yellow background, black text, and a light pastel header announcing the title and author of the entire piece. Like many student contributions to the cyberspace, this one contains a link to the web overview only on its contents page; the other lexias contain only footer icons to the contents, next page, and works cited. Since the reader can enter portions of this subweb from various

In contrast, Carlyle focuses on the English public's blind admiration for Hudson, the powerful railway king. He criticizes them for allowing a corrupt financier to be "[mounted] on the highest place you can discover in the most crowded thoroughfare." Carlyle argues the people's desire to erect a statue to Hudson is itself lamentable.

— dark blue background
— white lettering

| Trollope OV | The Way We Live Now OV | Thomas Carlyle OV | Hudson Statue OV |
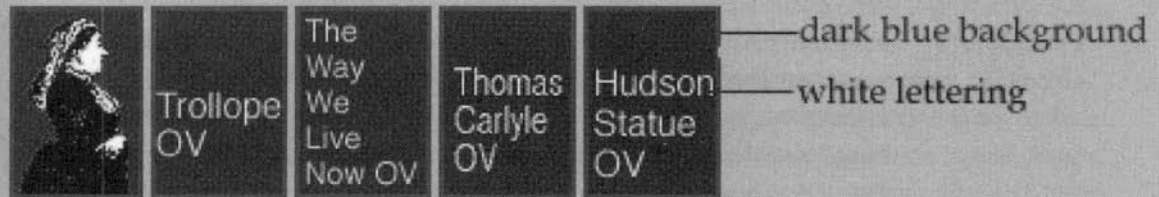
1. First three icons indicate increasing specificity: As one moves from left to right, one moves down directory structure.

| The Victorian Web (complete data set) | Trollope Materials | Materials about Trollope's *The Way We Live Now* |
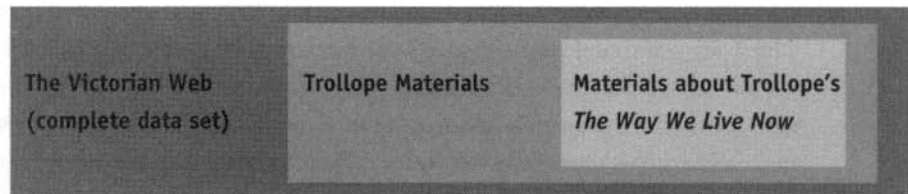
2. In contrast, the five icons indicate that the present document simultaneously participates in two subwebs or directories.

| Trollope Materials | | Carlyle Materials |

Materials about Trollope's
The Way We Live Now

Materials about Carlyle's
"Hudson's Statue"

Present Document
(discussing both works)
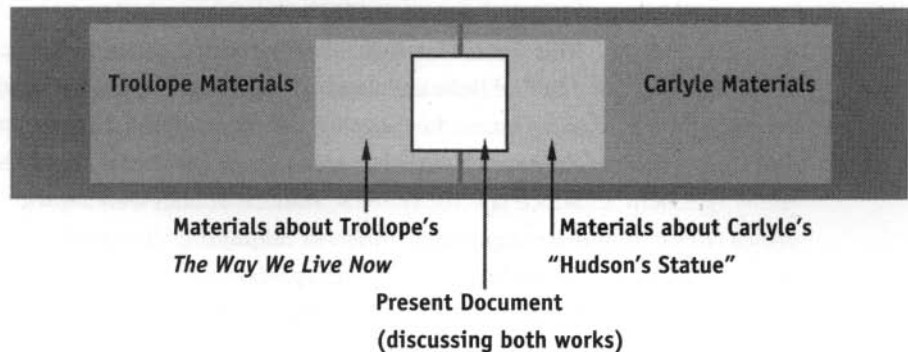
Figure 21. Footer Icons in World Wide Web Documents. This example from *The Victorian Web* shows how linked icons at the bottom of a lexia can indicate its simultaneous participation in several subwebs or document sets, thereby orienting the reader.

overview headings that indicate discussions of McLuhan, scribal culture, media in the seventeenth century, and so on, the reader needs to know the separateness—as well as the entire scope—of this subweb.

In concluding this section, I have to emphasize that on the World Wide Web the borders and limits of these hypertext documents, their edges, as it were, clearly have to be understood only as fictions, as agreed-on convention, since both links and search engines easily cross these proposed margins. The header graphic, for example, announces both the existence of a web (or major section of one) and implicitly proclaims its boundaries—only documents containing that header belong to this web—but on the Internet these claims are at best provisional, at worst an obvious fiction, since links to or from the lexias on any site make any assertion of boundaries into a gesture or wish or hope, particularly when, as in any large and complex web (site), the documents do not possess the kinship endowed by author function, for they have been produced by more than one author or entity. In sets of lexias created by a single author one can posit limits—that is, pretend they exist—more easily than one can for webs that both draw extensively on quoted passages and images created by others and also link to other sites as well. Nonetheless, we need such classifications in order to read. But the crossing of such textual (non)borders is one of the characteristics of hypertextuality, one completely analogous to the way links both permit one to employ a folder structure and yet not be confined by it.

This Text Is Hot. Readers of hypermedia need some indication of where they can find links and then, after they have found them, where those links lead; finally, after they have arrived at a new lexia, they need some justification why they have been led there. All these issues raise the question of the degree to which specific systems, authors, or both working together require an active, even aggressive reader. In examining a range of solutions to the first problem—how to indicate the presence of hot (or linked) text—I shall follow my usual procedure and begin by surveying the means thus far employed to do so and then suggest ways authors can write with and against their systems. As always, a major theme will be to suggest how World Wide Web authors can benefit from lessons provided by other forms of hypermedia.

In examining some ways existing hypertext systems signal the presence of linked text or images, I shall begin with least successful examples and proceed to better ones. Let us begin with Intermedia, though this time because its solution, though clear and unambiguous, proved too visually intrusive. All versions of this system employed a link marker in the form of a small hori-

zontal rectangle within which appears an arrow. This icon appeared automatically above and to the left of any section of linked text and could not be moved; in graphics documents, however, the authors could place it wherever they wished. Like many elements in Intermedia, the link marker worked synergistically with other system features. Clicking once on it, for example, highlighted the icons representing destination lexias in the Web View, and by going to the main menu, readers could learn both anchor extent (the extent of linked text) and anchor description (the label the author attached to it). Unfortunately, placing the icon above linked text proved too intrusive, for it distorted the document's leading—the spacing between lines—a particularly annoying effect when one placed links in a print text, say, a poem by Tennyson.

World Wide Web browsers offer a slightly better solution to the problem of how to inform readers about the location of links. As is well known, browsers conventionally indicate the presence of links with color and underscored text: Mosiac and Netscape established the convention that unlinked text appears in black against a light gray background, blue underlined text indicates the presence of a link, and magenta underlined text indicates a link that one has previously followed. I am of course describing the default version—that, in other words, which one receives if neither reader nor author customizes these elements; authors can choose entirely different color schemes or choose to make regular and linked text the same color, thus employing only underlining to indicate link presence.

Although the conventional HTML approach seems less visually intrusive than Intermedia's annoying link marker, its manner of signaling link presence, like that of the earlier system, produces a visual hodgepodge in alphanumeric text. The simple fact is that the links and the colors are always present, and for certain purposes their presence becomes too annoying. Although annoying in written text, such permanently displayed link markings sometimes work well with graphic elements, since a colored outline doesn't always intrude on an icon the way a combination of color and underlining do on text. Many intensely graphic sites, however, employ HTML options that permit authors to turn off such color variation, providing no visual cues to the location of links at all, because they know that in current browsers, when a mouse moves over a link, it turns into the image of a hand. As those who use the Web have become more sophisticated, designers increasingly assume that when users encounter a screen without any obvious links, they will move their cursors over images and other screen elements that they have learned are likely to serve as link anchors. In contrast, earlier websites often used linked icons and, unsure whether readers would know what to do, they added linked text, usually in very

small type, immediately below them. An increasingly sophisticated audience, in other words, no longer finds the absence of obvious clues disorienting.

In contrast to basic HTML and Intermedia, Microcosm, like several other hypertext systems, does not permanently display indications of links. As we have already observed when examining Microcosm's rich assortment of link types, this system invites active, even aggressive readers who interrogate the text they encounter (see "Forms of Linking," chapter 1). This approach, which removes any possibility of visually marring the appearance of literary texts, appears in the way it provides information about the presence and extent of linked material. In keeping with Microcosm's encouragement of the active reader, users who come upon a word or phrase that they believe likely to serve as an link anchor have several choices: they can double click on it, perform the equivalent action by choosing "Follow Link" from a menu, ask about link extent from a menu, or create their own links with the "Compute Links" function. For many applications, particularly educational and informational ones, the Microcosm approach strikes me as wonderfully appropriate to the medium. My only suggestion would be to follow Hypercard and Storyspace and make a simple key combination show both the presence and extent of author-created links. Storyspace's use of frames that surround hot text when readers hold down Option and Apple (or Command) keys simulta-neously proves a particularly valuable feature and one that I would like to see both Microcosm and HTML viewers emulate. Changing the cursor from an arrow to a hand to indicate that readers have encountered hot areas in a doc-ument has many advantages, yet it still requires in many cases that readers grope blindly around the screen, and in large text documents omitting any signs of existing links creates confusion; transient indications of links that readers could activate by simple operations, such as a key combination, would be useful as an additional feature.

Airlocks, Preview Functions, and the Rhetoric of Departure. All these system-based devices that we have just observed constitute the first, and simplest, part of any rhetoric of departure, for they inform readers that they can leave a text stream for somewhere or something else. Not surprisingly, most read-ers do not feel comfortable jumping off into limbo. Although much hypertext fiction and poetry plays with surprise and disorientation as desired aesthetic effects, other kinds of hypertext writing require some way of giving readers an idea of what links will do.

Such preview functions—what Mark Bernstein has called an "airlock"—serve to both inform and reassure readers, and when systems do not provide

adequate information, authors must find their own ways to obtain it. The just-discussed HTML convention of changing the color of anchors indicating links that have already been followed exemplifies one kind of valuable system support. When one mouses over hot text (an anchor), most web browsers also show the destination URL, though unfortunately not the title as well, in a panel at the bottom of the viewer window—though this feature does not seem to work with documents using frames.[3]

The point is that readers need a general idea of what to expect before they launch themselves into e-space. Help them, therefore, by making text serve as its own preview: phrase statements or pose questions that provide obvious occasions for following links. For example, when an essay on Graham Swift or Salman Rushdie adds links to phrases like "World War I" or "self-reflexive narrators," readers who follow them should encounter material on these subjects.

In addition, whenever possible provide specific information about a link destination by directly drawing attention to it, such as one does by creating text- or icon-based footer links. Another precise use of text to specify a link destination takes the form of specific directions. For example, in *The Victorian Web* to which student-authors contributed differing interpretations of the same topic, say, labor unrest in *North and South* or gender issues in *Great Expectations,* functioning as an editor, I have added notifications of that fact. Thus, at the close of essays quoting and summarizing different contemporary opinions about strikes and labor unrest, I have added "Follow for another contemporary view," a device that should be used sparingly, and lists of related materials, which are particularly useful when indicating bibliographical information and documents on the same subject.

Such careful linking becomes especially important in writing hypertext for the World Wide Web, since current browsers lack one-to-many-linking (see Figure 3), and it does not seem likely after more than a decade that they will ever incorporate it. This apparently minor lack has devastating consequences for authors, who have to create manually the link menus that other systems generate automatically. Without one-to-many links, readers and writers lose the crucial preview function they provide. I find that the effect of being reminded of branching possibilities produces a different way of thinking about text and reading than does encountering a series of one-to-one links sprinkled through a text.

The Rhetoric of Arrival. Many non-Web hypertext systems use various means to highlight the reader's point of arrival, thus permitting links into portions of longer lexias. Intermedia, for example, surrounded the destination anchor

with a marquee or moving dotted line that traversed a rectangular path around the intended point of arrival; a single mouse click turned off the marquee. Storyspace, in contrast, employs a rectangular block of reverse video around arrival anchors. Unfortunately, thus far, although World Wide Web authors can use the <A NAME> anchor feature to bring the reader to a particular portion of a document, no browser shows the exact extent of the arrival anchor. Instead, HTML just opens the arrival lexia at the line in which the anchor appears, something extremely useful for bibliographical citations and other lists.

The difficulty in the World Wide Web is exacerbated by the fact one often links to documents over which one has no control, and hence cannot insert an anchor. One way of accommodating those who link from outside involves using the identifying color schemes and headers described earlier. If one can obtain permission from the document's author or owner, one could place an anchor there. Similarly, if one can obtain permission to do so, one could copy and incorporate the arrival lexia within one's own web. Although such an approach, which I have used in *The Victorian Web*, occasionally proves useful, it strikes me as basically inefficient and contrary to the spirit of the World Wide Web's dispersed textuality.

Converting Print Texts to Hypertext. Before considering the best ways to hypertextualize printed matter, we might wish to ask why one would want to bother. After all, a somewhat sympathetic devil's advocate might begin, it's one thing to expend time and effort developing new modes of reading and writing, but why modify the book, which is in so many ways a perfectly good text-delivery machine? For many nonliterary uses, the answer seems obvious, since linked digital text permits an adaptability, speed of dissemination, and economy of scale simply not possible with print. Maintenance manuals for large, complex machines, like airplanes, parts catalogues, and many other uses of the codex form of text presentation seem better served in electronic form. For these reasons in some scholarly or scientific fields, such as high energy physics, the digital word has increasingly replaced the physical, and the most important form of publication takes place online. This movement away from printed text has certainly happened in the workplace, where people who formerly used printed schedules, parts catalogues, tax and real estate information, and delivery forms now read on screen; even courier and package delivery services now have customers sign electronic pads, as do the check-out girls at many supermarkets. Those of us who work with books every day and who enjoy doing so may not have noticed that for a growing number of people, printed matter, not just books, plays an ever smaller role

in their work day. The implications of this change seem obvious: in coming years, the printed book will eventually become, for many people, an increasingly exotic object in much the same way that beautiful illuminated manuscripts eventually appeared exotic to many raised on reading books. Perhaps, since as Bolter and Grushin argue, no information medium ever dies out completely, the codex book will be reserved for classic novels or recreated with on-demand publication; in an increasingly digital world, whatever happens, future readers will not experience books as we do.

But why in literature and in humanities education, our devil's advocate might continue, would we want to take works originally conceived for print and translate them into hypertext? Particularly given the comparably primitive state of on screen typography, why take a high-resolution object like a book and transform it into blurrier words on flickering screens? Now that the World Wide Web promises to make all of us self-publishers, these questions become particularly important. I would answer: we translate print into digital text and then hypertextualize it for several obvious reasons: for accessibility, for convenience, and for intellectual, experiential, or aesthetic enrichment impractical or impossible with print.

When I began to work with hypermedia a decade ago, the combination of a desire to create materials best suited for reading in an electronic environment and the need to avoid possible copyright infringement led my team to create all materials from scratch, but soon enough teaching needs drove us to include hypertext translations of print works. These needs will be familiar to anyone teaching today: works around which I had planned portions of a course suddenly went out of print. Placing otherwise unavailable documents within a hypertext environment allowed us to create an economical, convenient electronic version of a reserve reading room, one that never closes and one in which all materials always remain available to all readers who need them.

Now that the World Wide Web can link together lexias whose source code resides on different continents—the texts of many classic Victorian novels, for example, reside on a server in Japan—such accessibility provides an even stronger impetus to hypertextualize otherwise unavailable materials. This ease of accessibility from a great distance means that more readers can use one's text—and, in return, that one can hope to find texts translated by others for one's own use.

Books and articles on the Web take two very different forms, the first of which is the Web version that closely follows the print paradigm and uses the Internet solely as a means of making texts available—hardly an unworthy

goal. In contrast, the second approach attempts with varying degrees of success to translate works created for print into hypertext, thereby exploring the possible modes of scholarly publication in a digital world. By far the most common approach thus far is the Web version that preserves some formatting from the original print version but ignores many characteristic advantages of the new medium. The many PDF versions of scholarly and scientific articles downloadable from the Web exemplify this approach, as does Project Gutenberg, which tries to provide as many digitized versions of printed texts as is possible. Project Gutenberg embraces both primary and secondary texts, but its mission doesn't allow distinguishing between them. More scholarly textbases, like the Women Writers Project, necessarily have as their chief goal the preservation of as much information as is practicable about the physical form of often rare and usually inaccessible printed books; text encoding, rather than hypertextualization, understandably has the highest priority. Other projects, like Mitsuharu Matsuoka's *Victorian Literary Studies Archive* at Nagoya University take texts by 150 British and American authors of the nineteenth century—it includes, for example, two dozen books by Dickens and another half dozen about him—and join them to Masahiro Komatsu's Hyper-Concordance; although the *Archive* does not create hypertext translations of these works, it takes advantage of their digitization to create on-demand corpus-wide searches.

As valuable as these print preservation projects are, they do not help us answer the question, What will happen, and what has already happened, to the scholarly or critical book on the Web? Phil Gyford's translation of Samuel Pepys's *Diary* into a Weblog, at which we looked in chapter 3, exemplifies a new scholarly genre that took form outside the academy. Sites like *Slashdot* and many smaller ones on technical subjects, such as software for Weblogs or digital photography, are understandable, given the nature of early adopters: *Slashdot's* motto is "News for Nerds. Stuff that Matters." One does not expect scholarship in the humanities, with its long-established hostility to collaborative publication, to come online in such a radically collaborative form, and, yes, it turns out it that did not take place with any support from academic institutions, most of the members of which, I'm sure, do not know it exists. In contrast, new media studies (not surprisingly) has embraced the blog as a scholarly genre, attaching them to interviews and book reviews published online.

These Weblogs produce a kind of scholarship and criticism, perfectly valid, which centers on short forms—the essay and review. What about the scholarly book or monograph? In an attempt to answer this question, which has

been nagging at me for a decade, I decided to carry out an experiment, testing my proposition that hypermedia provides literary scholars with the equivalent of a scientific laboratory. Therefore, as some of my own books on Victorian art, literature, and religion have gone out of print, I retrieved copyright from my publishers, translated them into HTML, and placed them on *The Victorian Web;* since the appearance of *Hypertext 2.0* more than a dozen scholars have contributed one or more of their works to this enterprise. As I did so, I began to take advantage of characteristics of hypertext that justify translating a book into a web, the most basic of which is the synergy that derives from linking materials together. Reasons of economy and scale had prevented including illustrations of the many paintings mentioned in the original print version of my edition of the letters of John Ruskin and the Victorian artist, W. Holman Hunt, but once I had created web versions of this correspondence, my book on that artist, and articles from *Art Bulletin* and other journals, I found that these texts all worked together better than they had alone. A footnote providing the source of a letter could now, for example, lead to the text of the letter itself. Even more important, if an illustration was available anywhere in the text, it became available everywhere. Texts needing illustrations particularly benefit from electronic presentation, since a digital image, which is a matter of codes rather than physical marks on physical surfaces, multiplies while taking up no additional space. Using an image fifty times within one text or set of texts requires no more storage space or other resources than does using it once. Digitization thus permits the reuse of the image at several fixed places in a text; hypertextualization permits the image to be called up from numerous points as the reader finds its presence of use. In World Wide Web viewers, which temporarily store images downloaded from a network in a cache, reusing the same image takes much less time than it did obtaining it in the first place.

A final reason for translating a book into an electronic environment involves adding capacities not possible in print. Hypermedia translations of print texts in mathematics, sciences, music, history, and the arts have already appeared, employing sound, animation, video, and simulation environments. Let us look at some instances of these when proposing some general rules for employing sound and motion within alphanumeric text.

Assuming that you have a text that demands hypertextualization, how should you go about carrying it out? Since I have thus far converted several dozen books into various hypermedia systems, I believe the best way to answer that question would be to summarize my experience and use it to

draw some general guidelines. Furthermore, since some of these electronified books exist in two or more different hypertext environments, we can observe the degree to which minor differences in hardware and software influence hypertextualization.

First, one has to obtain an accurate digital version of the text to be converted. For my earlier books and articles, written before I began to work with computing, I used OminPage Professional, software for scanning text and then interpreting the resultant image into alphabetic characters—an often time-consuming process. Since I had written the first version of this book in Microsoft Word, working with it proved to be fairly easy. Converting the text for Intermedia required only saving it in a particular format (RTF) and then creating links within Intermedia. Working in Storyspace proved even easier because this system imports Word documents, automatically translating footnotes into linked lexias; the one chapter translated in HTML used the Storyspace export function to create a basic linked working text to which I then added header and footer icons. The DynaText version required adding SGML tags and manually adding coding for links.

In adapting the printed text for all four kinds of hypertext systems, I found I had to make decisions about the appropriate length of lexias. In each case, I took chapters already divided into sections and created additional subdivisions. Whereas print technology emphasizes the capacity of language to form a linear stream of text that moves unrelentingly forward, hypermedia encourages branching and creating multiple routes to the same point. Hypertextualizing a document therefore involves producing a text composed of individual segments joined to others in multiple ways and by multiple routes. Hypermedia encourages conceiving documents in terms of separate brief reading units. Whereas organizing one's data and interpretation for presentation in a print medium necessarily leads to a linear arrangement, hypermedia, which permits linear linking, nonetheless encourages parallel, rather than linear, arguments. Such structures necessarily require a more active reader. Since a major source of all these characteristics of hypermedia derives from these linked reading units, one has to create hypermedia with that fact in mind. Therefore, when creating webs, conceive the text units as brief passages in order to take maximum advantage of the linking capacities of hypermedia.

Whatever its ultimate effect on scholarly and creative writing, hypermedia today frequently contains so-called legacy text—texts, like the 1992 version of *Hypertext,* originally created for delivery to the reader in the form of a printed book. Such materials combine the two technologies of writing by attaching linked documents, which may contain images, to a fixed steam of text. Any-

one preparing such materials confronts the problem of how best to preserve the integrity of the older text, which may be a literary, philosophical, or other work whose overall structure plays an important role in its effect. The basic question that someone presenting text created for print technology in hypermedia must answer is, Can one divide the original into reading units shorter than those in which it appeared in a book, or does such presentation violate its integrity? Some literary works, such as sonnet sequences or Pascal's *Pensées,* seem easily adapted to hypermedia since they originally have the form of brief sections, but other works do not seem adaptable without doing violence to the original. Therefore, when adapting documents created for book technology, do not violate the original organization, though one should take advantage of the presence of discrete subsections and other elements that tend to benefit from hypertextualization. However, when the text naturally divides into sections, these provide the basis of text blocks. The hypermedia version must contain linkages between previous and following sections to retain a sense of the original organization.

Converting Footnotes and Endnotes. The treatment of notes in the four hypertext versions of the first version of this book provides an object lesson about the complexities of working in a new kind of writing environment. It reminds us, in particular, how specific writing strategies depend on a combination of equipment and often apparently trivial features of individual systems, some of which militate against what seem to be intrinsic qualities of hypertext. For example, as we have already observed in "Reconfiguring Text," hypertextualization tends to destroy the rigid opposition between main and subsidiary text, thereby potentially either removing notes as a form of text or else demanding that we create multiple forms of them. Certainly, in hypertextualizing some of my own works, longer footnotes and endnotes containing substantive discussions became lexias in their own right.

Briefer notes that contain bibliographical citations embody a more complex problem that has several different solutions, each of which creates a different kind of hypertext. If one wishes to produce a hypertext version of a printed original that remains as close as possible to it, then simply converting endnotes into a single list of them makes sense; using the <A Name> tag, each link will lead to the appropriate item. Another approach, which produces an axially structured hypertext, involves placing each bibliographical note in its own lexia and linking to it. Using simple HTML, authors can make this lexia open in a number of ways. Following standard HTML procedure, the note replaces the text in which the link to the note appears; one can create a

return link to the main text, or rely on knowledgeable readers to use the browser's "Back" button. In addition, one can leave the body of the document on screen by using the "target = '_blank'" option in the link (A HREF), which makes the note open in a new window; authors who take this route, opening annotations in a separate window, often include instructions to close the window to return. Unfortunately, both of these convenient approaches produce an unattractive document in which a sentence or two appears at the very top of a large, otherwise empty window. A third approach uses HTML frames to bring up the text of the note in a column next to the main text, and yet a fourth uses HTML tables to place the text in the margin, thereby recreating the effect of some eighteenth-century books; tables are, however, very difficult to use when one of the columns has large blank areas. Perhaps the most elegant solution employs Java scripts to create small pop-up windows for each note. The problem here involves the nature of one's audience: Java scripts notoriously do not work in all browsers or even in all versions of the same one. If you create your materials for the widest possible audience, which includes many users with old versions of Netscape and Internet Explorer, you will have to forgo using this elegant, if time-consuming, solution, but if you direct your materials at a single educational or commercial institution that has announced standards for supported hardware and software, you can use anything that works there, though you may lose people working at home.

Whatever option you choose (and all have advantages and disadvantages), try not to use superscript numbers to indicate the presence of links. Not only does it prove difficult to mouse down on the small target provided by a single tiny character, but, more important, numbered notes only make sense when readers consult them in a list, and placing notes in separate lexias destroys this list. I find that one can almost always use a relevant phrase as an anchor for a note to a link. When the note contains bibliographical information, one can link to a relevant phrase, such as "(source)" or "(bibliographical materials)," placed at the end of the sentence.

Wherever possible, the best and most obvious solution to the problem of representing annotations in Web documents involves converting all bibliographical notes to the current Modern Language Association (MLA) in-text citation form, whether one links all such citations to a list of references or just includes the relevant bibliographical items in each lexia; I prefer the latter approach.

In addition to dividing a print text into sections, adapting notes and bibliography, and adding header and footer icons, creating a hypermedia version

requires adding features and materials that would be impracticable or impossible to have in a printed version. Thus, the Storyspace, Microcosm, and World Wide Web versions of both my Pre-Raphaelite materials and *Hypertext* contain a great many links that serve as cross-references and that provide additional paths through the text, and they have additional images, too. These webs also have elements not found in books, such as multiple overviews that permit traversing them in ways difficult, or impossible, in a print version. All the hypermedia translations of *Hypertext,* for example, contain overviews for both critical theory and hypertext, and various versions add ones for information technology, scribal culture, and individual theorists.

Perhaps the most obvious difference—in addition to links—between the hypertext and print versions lies in its size: the way links produce an open-ended, changing, multiply authored Velcro-text appears nowhere more clearly than in the fact that so much new material appears in *Hypertext in Hypertext* than in the print version. As one might expect from what I've already written, once I created Intermedia and Storyspace versions for my course on hypertext and literary theory, my students read them as wreaders—as active, even aggressive readers who can and did add links, comments, and their own sub-webs to the larger web into which the print has version has transformed itself. Within a few years the classroom version contained five hundred of their interventions, criticizing, expanding, and commenting on the text, often in ways that take it in very different directions than I had intended. In addition to some fifty of these new lexias, *Hypertext in Hypertext* contains entries on individual theories and theorists from *The Johns Hopkins Guide to Literary Theory and Criticism,* edited by Michael Groden and Martin Kreiswirth, as well as materials by Gregory Ulmer and Jacques Derrida. To these materials, we added, with permission, some of Malcolm Bradbury's parodies of critical theory and all the reviews the book had received by the time we went into production. These new lexias, which constitute a subweb of their own, serve to insert other voices, not always in agreement with mine, into the expanded text. Throughout, the principle of selection was be a cardinal rule of hypertext adaptation—use materials only when they serve a purpose and not just because you have them. Hypertext writing, in other words, should be driven by needs and not by technology.

Rules for Dynamic Data in Hypermedia. The preceding pages have focused on writing hypertext with essentially static forms of data—words, images, diagrams, and their combinations. Kinetic or dynamic information, which

includes animation and sound (animal cries, human speech, or music), raises additional problems because it imposes a linear experience on the reader. This strong element of linearity itself presents no fundamental difficulty, or even novelty, since as Nelson pointed out long ago, individual blocks of text, particularly those with few links, offer a linear reading path.

The difference between dynamic and static data lies in the fact that it is so importantly time-bound. Speech or visual movement potentially immerses readers in a linear process or progression over which they have relatively less control than they do when encountering a static document, such as a passage of writing. One can stop and start one's reading at any point—when the phone rings, a child cries, or a thought strikes one. Turning one's attention away from time-bound, linear media, in contrast, throws one out of one's position within a linear stream, and this place cannot be recovered, as it can with writing, simply by turning attention back to the text, since one's point, or location, or place within the text has moved on. Therefore, when one follows a link from a text discussing, say, mitosis to digitized animation of a cell dividing or from a work of criticism to a scene from Shakespeare, one cues the beginning of a process. Such dynamic data place the reader in a relatively passive role and turns hypermedia into a broadcast, rather than an interactive, medium.

Many websites and CD-ROMs employ Quicktime movies accompanied by sound to present materials often more efficiently and more enjoyably encountered as text. Using the talking heads approach in which someone filmed from the chest or neck upward looks out of the screen and talks to us can occasionally prove an effective strategy, particularly when establishing a person's appearance and character seems important, but it expends two kinds of valuable resources: storage capacity and, because it occupies time, the reader's patience, or at least forbearance. Too many creators of HTML and CD-ROM materials seem grossly unaware of the fact that one of the key advantages of written language lies precisely in abstractness and indirection that permit communicating important information with great economy.

Systems designers and hypermedia authors have to empower readers in at least two ways. First, they must permit readers to stop the process and exit the environment easily. Second, they must indicate that particular links lead to dynamic data. One may use labels or icons for this purpose, and one may also connect the link-indicator to an additional document, such as a menu or command box, that gives users precisely the kind of process-information they can activate. Such documents in the form of a control panel, which per-

mits the reader to manipulate the process to the extent of replaying all or part of a sequence, make the reader more active. If one employs talking heads or voiceovers, one must, of course, allow readers to stop them in midsequence. (Voyager's *Freak Show* CD-ROM makes a witty play on these features by having its Master of Ceremonies or Ringmaster respond with different expressions of annoyance each time we cut him off in midsentence.)

The one digital form that does not create problems for hypermedia is the fundamentally controllable multimedia document created by Apple's Quicktime VR (Virtual Reality) or rival software like Ipix and Live Picture. These kinds of software, whose creations are easily inserted into HTML, produce two different kinds of manipulatable three-dimensional images, the so-called spherical and cylinder panoramas. In the first, one finds oneself placed in a three-dimensional space within which one can rotate 360 degrees by using the mouse to stop, start, and control the speed of rotation or, using a zoom function, move closer or farther away. *The World Book Encyclopedia's* two CD-ROMs, for example, include dozens of Ipix scenes in the format they call "bubble views," including St. Mark's Square, Venice; Stonehenge; the Maya ruins at Palenque; the Coliseum in Rome; and the Zojoi Temple in Japan. Or if one wants a Web example, go to NASA's Mars Pathfinder site for a panorama of the Sagan Memorial Station, or *A Wrinkle in Time: a collaborative synchronized effort by QTVR producers around the globe* to create a hundred panoramic views at the same time on December 21, 1997 (see bibliography).

The other kind of Quicktime VR (the cylinder panorama) takes the form of a virtual object that users can turn 360 degrees, examining it as they wish, as well as zooming in and out. This kind of image, possible only with computing, has great value when representing three-dimensional objects online. *The Victorian Web*, for example, contains a Quicktime VR image of an unattributed bronze statue of a young woman that I believe was created by Alfred Drury (1856–1944). While carrying out research that might lead to an attribution, I visited various English photo-archives and collections of sculpture without finding any particularly convincing evidence. Several years later, after I had created a rotatable Quicktime VR image of the statue, I came upon a photograph of Drury's 1896 bronze, *Griselda*, in a 1980 catalogue from Christopher Wood Gallery in London. Observing the way in which the sculpture depicted the pleats and folds around the shoulder of the *Griselda,* I opened the Quicktime VR image of the unattributed statue, using my mouse to rotate it until I positioned the statue as seen from the same vantage point

as the photograph of *Griselda*. At that point, it became obvious that both sculptures had been executed by the same person. Obviously, anyone interested in Victorian and Edwardian sculpture would prefer to have both works in the same physical space and be able to move them about until one could look at them from the same vantage point; anyone who has ever studied sculpture of this period immediately realizes how unlikely would be the opportunity to make such a comparison. Instead, the researcher usually has to use published photographs, each of which of necessity is taken from one position, and even if one visits major museums, one often finds that sculptures are displayed in such a way (often in a corner or against a wall) that one cannot obtain the view one wants. With Quicktime VR, one can. Anyone interested in sculpture clearly cares about the materiality, the sheer mass and surface of the object in question, and so one really wants access to the original objects with the ability to move and touch them and gaze at them for a long time under different kinds of light conditions. If one cannot have the actual object, then Quicktime VR is the next best thing; it is certainly superior to my 35 mm slides, which make *The Ghent Altarpiece* and a tiny wood-engraving appear to be on the same scale.

Hypertext as Collage Writing

Most current examples of hypertext take the form of texts originally produced by the hypertext author in and for another medium, generally that of print. In contrast, this section on collage writing derives from a hypertext, though it incorporates materials ultimately derived from printed books, too. On Tuesday, June 7, 1994, at 17:01:54 Eastern Standard Time, Pierre Joris, a faculty member at the State University of New York, posted some materials about collage on a electronic discussion group called Technoculture. (I have discussed the first year of Technoculture's existence in "Electronic Conferences and Samiszdat Textuality: The Example of Technoculture," in the 1993 MIT volume, *The Digital Word,* which I edited with Paul Delany.) Joris wished to share with readers of this e-conference a gathering of texts on the subject he had delivered as a combination of an academic paper and performance art while in graduate school. His materials seemed to cry out for a hypertext presentation, and so after moving them from my mailbox to a file on the Brown University IBM mainframe, I transferred them—in the jargon, "downloaded them"—in a single document via a phone line to a Macintosh whirring away in my study at home. Next, I opened them in Microsoft Word, and, passage by passage, quickly copied the individual elements of "Collage between Writing and Painting," pasting each into a separate writing space or lexia in a new Story-

space web and then linked them together. Along the way, I created the following opening screen (or analogue to a book's title page):

COLLAGE BETWEEN WRITING AND PAINTING

Pierre Joris

George P. Landow

being an assemblage starring

Kurt Schwitters & Tristan Tzara
with special guest appearances by
Georges Braque &
Pablo Picasso

and also featuring
dedicated to . . .

This opening screen, which also serves as a combination overview, information map, contents page, and index, contains links from the obvious places—such as, for example, all the proper names it lists. Clicking on "Collage" takes one either to one possible terminal point of the web or to a definition of the term from *Le Petit Robert*. Since this dictionary definition, which mentions Picasso and Braque, serves as a another ready-made overview or crossroads document, I linked various words in it to permit readers to traverse Joris's materials in multiple ways. "COLLAGE," for example, leads to a dozen and a half mentions of the term, and the names of the artists link to illustrations of their work. Because I created this web largely as an experiment and not for publication, I did not have to worry at the moment about copyright issues and therefore scanned monochrome images of Braque's *Le Courrier* and Picasso's *Still Life with Chair Caning* and linked them to the names of the artists. At the same time I added H. W. Janson's discussions of collage, linking them as well. Finally, I created a list of thirty authors whose statements Joris included in "Collage between Writing and Painting," linking this list to the phrase "also featuring" on the title screen.

At this point, some of the similarities between hypertext and collage will have become obvious. Having first appropriated Joris's materials by placing them in a web and then adding materials to it that they seemed to demand, I found that, like all hypertexts, it had become open-ended, a kind of Velcro-text to which various kinds of materials began attaching themselves. First, I included a discussion of Derrida and appropriation, after which I added

definitions of hypertext and a list of qualities that it shares with collage. Next, I added several dozen screenshots, or pictures of how the screen appears while reading, of various hypertext webs; these came from a since-published web that served as an introduction to the hypertext anthology, *Writing at the Edge*. Then, I added a dozen photographs, each involving issues of representation, illusion, simulation, or subject and ground. Finally, I added a new title page for *Hypertext and Collage: being in part, an appropriation of "collage between writing and painting."*

After using this web to deliver my contribution to the August 1995 Digital Dialectic conference at the Art Center College of Design, I discovered I would have to transform it into a more or less traditional essay if it were to be part of the planned volume. These pages thus represent a translation of the *Hypertext and Collage Web*. When I write "translation," I cannot help thinking of the Italian maxim *"traddutore = traditore"* or "translator = traitor." Converting the essay from one information technology to another, I continually encountered the kind of reduction that one encounters translating—or representing—something in three (or more) dimensions within a two-dimensional medium. An examination of the differences between the two versions will take us a way into understanding the reasons for describing hypertext as collage writing.

The online version of the *Oxford English Dictionary* defines collage, which it traces to the French words for pasting and gluing, as an "abstract form of art in which photographs, pieces of paper, newspaper cuttings, string, etc., are placed in juxtaposition and glued to the pictorial surface; such a work of art." The *Britannica Online* more amply describes it as the

artistic technique of applying manufactured, printed, or "found" materials, such as bits of newspaper, fabric, wallpaper, etc., to a panel or canvas, frequently in combination with painting. In the 19th century, *papiers collés* were created from papers cut out and put together to form decorative compositions. In about 1912–13 Pablo Picasso and Georges Braque extended this technique, combining fragments of paper, wood, linoleum, and newspapers with oil paint on canvas to form subtle and interesting abstract or semiabstract compositions. The development of the collage by Picasso and Braque contributed largely to the transition from Analytical to Synthetic Cubism.

This reference work, which adds that the term was first used to refer to dada and surrealist works, lists Max Ernst, Kurt Schwitters, Henri Matisse, Joseph Cornell, and Robert Rauschenberg as artists who have employed the medium.

In *The History of World Art*, H. W. Janson, who explains the importance of collage by locating it within the history of cubism, begins by describing Picasso's *Still Life* of 1911–12: "Beneath the still life emerges a piece of imita-

tion chair caning, which has been pasted onto the canvas, and the picture is 'framed' by a piece of rope. This intrusion of alien materials has a most remarkable effect: the abstract still life appears to rest on a real surface (the chair caning) as on a tray, and the substantiality of this tray is further emphasized by the rope." According to Janson, Picasso and Braque turned from brush and paint to "contents of the wastepaper basket" because collage permitted them to explore representation and signification by contrasting what we in the digital age would call the real and virtual. They did so because they discovered that the items that make up a collage, "'outsiders' in the world of art," work in two manners, or produce two contrary effects. First, "they have been shaped and combined, then drawn or painted upon to give them a representational meaning, but they do not lose their original identity as scraps of material, 'outsiders' in the world of art. Thus their function is both to represent (to be part of an image) and to present (to be themselves)" (522–23).

Hypertext writing shares many key characteristics with these works of Picasso, Braque, and other cubists, particularly their qualities of juxtaposition and appropriation. Some of these qualities appear when one compares the hypertext and print versions of my discussion. First of all, despite my division of this essay into several sections and the use of figures that a reader might inspect in different orders, this essay really only allows one efficient way of proceeding through it. In contrast, the original hypertext version permits different readers to traverse it according to their needs and interests. Thus, someone well versed in twentieth-century art history might wish to glance only briefly at the materials on collage before concentrating first on the materials about hypertext. Someone else more acquainted with hypertext could concentrate on the materials about collage. Others might wish to begin with one portion of the discussion, and then, using available links, return repeatedly to the same examples, which often gather meaning according to the contexts in which they appear.

Another difference between the two forms of "my" discussion of this subject involves the length of quoted material and the way the surrounding texts relate it to the argument as a whole. Take, for example, the passage I quoted above from Janson's *History of World Art*. In the Storyspace version the passage is several times longer than in the print one, and it appears without any introduction. The object here is to let the quoted, appropriated author speak for himself, or, rather, to permit his text to speak for itself without being summarized, translated, distorted by an intermediary voice. To write in this manner—that is to say, to copy, to appropriate—seems suited to an electronic environment, an environment in which text can be reproduced, reconfigured,

and moved with very little expenditure of effort. In this environment, furthermore, such a manner of proceeding also seems more honest: the text of the Other may butt up against that by someone else; it may even crash against it. But it does seem to retain more of its own voice. In print, on the other hand, one feels constrained to summarize large portions of another's text, if only to demonstrate one's command (understanding) of it and to avoid giving the appearance that one has infringed copyright.

These two differences suggest some of the ways in which even a rudimentary form of hypertext reveals the qualities of collage. By permitting one to make connections between texts and text and images so easily, the electronic link encourages one thus to think in terms of connections. To state the obvious: one cannot make connections without having things to connect. Those linkable items must not only have some qualities that make the writer want to connect them, they must also exist in separation, apart, divided. As Terence Harpold has pointed out in "Threnody," most writers on hypertext concentrate on the link, but all links simultaneously both bridge and maintain separation (174). This double effect of linking appears in the way it inevitably produces juxtaposition, concatenation, and assemblage. If part of the pleasure of linking arises in the act of joining two different things, then this aesthetic of juxtaposition inevitably tends toward catachresis and difference for their own end, for the effect of surprise, and sometimes surprised pleasure, they produce.

On this level, then, all hypertext webs, no matter how simple, how limited, inevitably take the form of textual collage, for they inevitably work by juxtaposing different texts and often appropriating them as well. Such effects appear frequently in hypertext fiction. Joshua Rappaport's "The Hero's Face" (one of the webs included in *Writing at the Edge*) uses links, for example, to replace what in earlier literary writing would have been an element internal to the text; that is, the link establishes a symbolic as well as a literal relationship between two elements in a document. In "The Hero's Face," after making one's way through a series of lexias about the members of a rock band, their experiences on tour, and their musical rivalry—all of which might seem little more than matters of contemporary banality—the reader follows a link from a discussion of the narrator's seizing the lead during one performance and finds herself or himself in what at first appears to be a different literary world, that of the Finnish epic, the *Kalelava*.

Following Rappaport's link has several effects. First, readers find themselves in a different, more heroic age of gods and myth, and then, as they realize that the gods are engaged in a musical contest that parallels the rock

group's, they also see that the contemporary action resonates with the ancient one, thereby acquiring greater significance as it appears epic and archetypal. This single link in *Hero's Face,* in other words, functions as a new form of both allusion and recontextualization. Juxtaposing two apparently unconnected and unconnectable texts produces the pleasure of recognition.

Such combinations of literary homage to a predecessor text and claims to rival it have been a part of literature in the West at least since the ancient Greeks. But the physical separation between texts characteristic of earlier, nonelectronic information technologies required that their forms of linking—allusion and contextualization—employ indicators within the text, such as verbal echoing or the elaborate use of parallel structural patterns (such as invocations or catalogues). Hypertext, which permits authors to use traditional methods, also allows them to create these effects simply by connecting texts with links. David Goldberg's web essay, "New Perverse Logic: The Interface of Technology and Eroticism in J. G. Ballard's *Crash* and William Gibson's *Neuromancer*" (1996), uses HTML frames to accomplish a similar form of juxtaposition without links. Clicking on various topics from the opening screen opens a two-column document, in one half of which appear discussions of Baudrillard and Gibson, virtual textuality and Ballard, and two passages from the novelist.

Hypertext here appears as textual collage—*textual* referring to alphanumeric information—but more sophisticated forms of this medium also produce visual collage as well. Any hypertext system (or, for that matter, any computer program or environment) that displays multiple windows produces such collage effects. Multiwindow systems, such as Microcosm, Storyspace, Intermedia, Sepia, and the like, have the capacity to save the size and position of individual windows. This capacity leads to the discovery of what seems a universal rule at this early stage of e-writing: authors will employ any feature or capacity that can be varied and controlled to convey meaning. All elements in a hypertext system that can be manipulated are potentially signifying elements. Controlled variation inevitably becomes semiosis. Hypertext authors like Stuart Moulthrop have thus far written poems in the interstices of their writing environments, creating sonnets in link menus, and sentences in the arrangements of titles of lexias in the Storyspace view.

Inevitably, therefore, authors make use of screen layout, tiled windows, and other factors to . . . write. For example, in an informational hypertext, such as *The In Memoriam Web,* tiling of documents constructs a kinetic collage whose juxtaposition and assembling of different elements permits easy reference to large amounts of information without becoming intrusive (see

CLANG!

Clang

Like we ever mean to say anything.

Across Highway

across the empty highway,

Andy Paused

Andy paused for a second and let his senses
adjust to the shock. The floor had been dropping
all week now. As he sat by the open window and
the frozen night air embraced the room, he
realized that it was all part of the long slide
down...

10110010111

Ones and zeroes cascaded through everything.
They thought they were the soul of the mass
consciousness now. They were wrong.

He felt ill

He still felt slightly ill from the shock. At the
bottom of the world something was failing.
Or operating as it should, he didn't know.
He wondered if anyone else felt it.

Starting

It was starting.

Drive Sinking

I felt like I was sinking.

Figure 22. Digital Collage in Hypertext Narrative: Nathan Marsh's *Breath of Sighs and Falling Forever*. Marsh has arranged the texts that make up his web so that some lexias show in their entirety, others only in part. In making their way through this fiction, readers encounter multiple narrative lines. The web continually changes the juxtaposition of texts as the narrator navigates in the text. In the course of reading, one is repeatedly returned to the lexia "Clang!" which opens with the sound of an explosion, but the meaning of the word changes according to the lexia that one has read immediately before encountering it.

Figure 11). In addition to employing the set placement of the windows, readers can also move windows to compare two, three, or more poems that refer back and forth among themselves in this protohypertextual poem.

Turning now to another work of hypertext fiction, one sees that in Nathan Marsh's *Breath of Sighs and Falling Forever* lexias place themselves around the surface of the computer monitor, making the screen layout support the narrative as one crosses and recrosses the tale at several points (Figure 22). In *The In Memoriam Web* the collage-effect of tiling, separate windows, and juxtaposed text arises in an attempt to use hypertext technology to shed light on qualities of a work created for the world of print (see Figure 9.) Here this story arises out of the medium itself. In making their way through this fiction read-

ers encounter multiple narrative lines and corollary narrative worlds both joined and separated by ambiguous events or phenomena. At certain points readers cannot tell, for example, if one of the characters has experienced an earthquake tremor, a drug reaction, or a powerful illumination. Has the floor actually fallen, or are we supposed to take a character's experience as figurative? Certainly, one of the first lexias readers encounter could suggest any and all of these possibilities: "Andy paused for a second and let his senses adjust to the shock. The floor had been dropping all week now. As he sat by the open window and the frozen night air embraced the room, he realized that it was all part of the long slide down." Clicking on this brief lexia leads one to "Clang!," which opens with a loud sound and displays its single word in 80-point type. As one reads one's way through "Breath of Sighs" one repeatedly returns to "Clang!" but finds that it changes its meaning according to the lexia that one has read immediately before encountering it.

Marsh has arranged each of the texts that make up his web so some lexias show in their entirety, others only in part. As one reads through this web, one encounters a continually changing collage of juxtaposed texts. Two points about hypertext writing appear in Marsh's web. First, we realize that such collage writing produces a new kind of reading in which we must take into account not only the main text but also those that surround it. Second, this emphasis on the increasing importance of the spatial arrangement of individual lexias leads to the recognition that writing has become visual as well as alphanumeric; or since visual layout has always had a major impact on the way we read printed texts, perhaps it would be more accurate to say that in hypertext (where the author controls more of the layout) hypertext writing requires visual as well as alphanumeric writing. Marsh's web exemplifies a form of hypertext fiction that draws on the collage qualities of a multi-window system to generate much of its effect.

Despite interesting, even compelling, similarities, hypertext collage obviously differs crucially from that created by Picasso and Braque. Hypertext and hypermedia always exist as virtual, rather than physical, texts. Until digital computing, all writing consisted of making physical marks on physical surfaces. Digital words and images, in contrast, take the form of semiotic codes, and that fundamental fact about them leads to the characteristic, defining qualities of digital infotech: virtuality, fluidity, adaptability, openness (or existing without borders), processability, infinite duplicability, capacity for being moved about rapidly, and finally, networkability. Digital text is virtual because we always encounter a virtual image, the simulacrum, of something stored in memory rather than encounter any so-called text itself or physical

instantiation of it. Digital text is fluid because, taking the form of codes, it can always be reconfigured, reformatted, rewritten. Digital text is hence infinitely adaptable to different needs and uses, and since it consists of codes that other codes can search, rearrange, and otherwise manipulate, digital text is also always open, unbordered, unfinished and unfinishable, capable of infinite extension. Furthermore, since it takes the form of digital coding, it can be easily replicated without in any way disturbing the original code or otherwise affecting it. Such replicability in turn permits it to be moved rapidly across great spaces and in so doing creates both other versions of old communication, such as the bulletin board, and entirely new forms of communication. Finally—at least for now—all these other qualities of digital textuality enable different texts (or lexias) to join together by means of electronic linking. Digitality, in other words, permits hypertextuality.

The connection of the fundamental virtuality of hypertext to the issue of collage becomes immediately clear as soon as one recalls the history of collage and the reasons for its importance to Picasso, Braque, Schwitters, and other painters. As Janson explains, collage arose within the context of cubism and had powerful effects because it offered a new approach to picture space. Facet cubism, its first form, still retained "a certain kind of depth," and hence continued Renaissance perspectival picture space. "In collage Cubism, on the contrary, the picture space lies in front of the plane of the 'tray'; space is not created by illusionistic devices, such as modeling and foreshortening, but by the actual overlapping of layers of pasted materials" (522–23). The effect of collage cubism comes from the way it denies much of the recent history of Western painting, particularly that concerned with creating the effect of three-dimensional space on a two-dimensional surface. It does so by inserting some physically existing object, such as Picasso's chair-caning and newspaper cuttings, onto and into a painted surface. Although that act of inclusion certainly redefines the function and effect of the three-dimensional object, the object nonetheless resists becoming a purely semiotic code and abrasively insists on its own physicality.

The collage of collage cubism therefore depends for its effect on a kind of juxtaposition not possible (or relevant) in the digital world—that between physical and semiotic. Both hypertext and painterly collage make use of appropriation and juxtaposition, but for better or worse one cannot directly invoke the physical within the digital information regime, for everything is mediated, represented, coded.

The final lexia in this grouping, however, moves this more traditional form of virtuality to that found in the world of digital information technology,

for it both repeats sections of all the images one may have seen (in whatever order), blending them with multiply repeated portions of a photograph of a Donegal, Ireland, sunset, and it also insists on the absence of any solid, physical ground: not only do different-sized versions of the same image appear to overlay one another but in the upper center a square panel has moved aside, thus revealing what the eye reads as colored background or empty space. In this photographic collage or montage, appropriation and juxtaposition rule, but, since all the elements and images consist of virtual images, this lexia, like the entire web to which it contributes, does not permit us to distinguish (in the manner of cubist collage) between virtual and real, illusion and reality.

This last-mentioned lexia bears the title "Sunset Montage," drawing on the secondary meaning of *montage* as photographic assemblage, pastiche, or, as the *OED* puts it, "the act or process of producing a composite picture by combining several different pictures or pictorial elements so that they blend with or into one another; a picture so produced." I titled this lexia "Sunset Montage" to distinguish the effect of photographic juxtaposition and assemblage from the painterly one, for in photography, as in computing, the contrast of physical surface and overlaying image does not appear. Upon hearing my assertion that hypertext should be thought of as collage writing, Lars Hubrich, a student in my hypertext and literary theory course, remarked that he thought *montage* might be a better term than *collage*. He had in mind something like the first *OED* definition of montage as the "selection and arrangement of separate cinematographic shots as a consecutive whole; the blending (by superimposition) of separate shots to form a single picture; the sequence or picture resulting from such a process." Hubrich is correct in that whereas collage emphasizes the stage effect of a multiwindowed hypertext system on a computer screen at any particular moment, montage, at least in its original cinematic meaning, places important emphasis on sequence, and in hypertext one has to take into account the fact that one reads—one constructs—one's reading of a hypertext in time. Even though one can backtrack, take different routes through a web, and come upon the same lexia multiple times and in different orders, one nonetheless always experiences a hypertext as a changeable montage.

Hypertext writing, of course, does not coincide fully with either montage or collage. I draw upon them chiefly not to extend their history to digital realms, and, similarly, I am not much concerned to allay potential fears of this new form of writing by deriving it from earlier avant-garde work, though in another time and place either goal might provide the axis for a potentially interesting essay. Here I am more interested in helping us understand this

new kind of hypertext writing as a mode that both emphasizes and bridges gaps and that thereby inevitably becomes an art of assemblage in which appropriation and catachresis rule. This is a new writing that brings with it implications for our conceptions of text as well as reader and author. It is a text in which a new kind of connection has become possible.

Is This Hypertext Any Good?

Or, How Do We Evaluate

Quality in Hypermedia?

What is quality in hypertext? How, in other words, do we judge a hypertext collection of documents (or web) to be successful or unsuccessful, to be good or bad *as hypertext*? How can we judge if a particular hypertext achieves elegance or never rises above mediocrity? Those questions lead to another: What *in particular* is good about hypertext? What qualities does hypertext have in addition to those possessed by nonhypertextual forms of writing, which at their best can boast clarity, energy, rhythm, force, complexity, and nuance? What qualities, in other words, derive from a form of writing that is defined to a large extent by electronic linking? What good things, what desirable qualities, come with linking, since the link is the defining characteristic of hypertext? As I have argued earlier, the defining qualities of the medium include multilinearity, consequent potential multivocality, conceptual richness, and—especially where informational hypertext is concerned—reader-centeredness or control by the reader. Obviously, works in a hypertext environment that fulfill some or all of these potential qualities exemplify quality in hypermedia. Are there other perhaps less obvious sources of quality?

One question we must raise while trying to identify sources of quality in hypermedia is, To what extent do literary and informational hypermedia differ? In the following pages, I shall propose several possible ways to answer these questions, each of which itself involves a central issue concerning this information technology.

Individual Lexias Should Have an Adequate Number of Links. Since the link is the characteristic feature that defines hypertextuality, one naturally assumes that lexias containing a larger number of valuable links are better than those that have fewer. Of course, the emphasis here must be on "valuable." In the early days of the Web, one would often come upon personal homepages in which virtually every word other than the articles *the, a,* and *an* had links, many of which led to external sites only generally connected to the discussion at hand. Obviously, overlinking, like choosing poor link destinations, is bad linking. As Peter Brusilovsky and Riccardo Rizzo have pointed out in "Map-Based Horizontal Navigation in Educational Hypertext," the opposite prob-

lem—a lack of linking precisely in those places one would expect it to appear—characterizes much recent World Wide Web hypertext. Part of the problem here may come directly from the World Wide Web's use of unsuitable terminology derived from print technology, such as *homepage,* which locks neophyte users into an inappropriate paradigm. Brusilovsky and Rizzo correctly note that much hypertext today takes the form of passages of unlinked text surrounded by navigation links. Encountering these kinds of lexia, one receives the impression that the authors, who have dropped digitized versions of printed pages into an electronic environment, don't seem to grasp the defining qualities of hypermedia and use HTML chiefly as a text formatting system. They are still working, in other words, with and within the paradigm of the printed page and book.

The Victorian Web (victorianweb.org), an academic site I manage that receives as many as fifteen million hits a month, contains four basic kinds of documents: (1) overviews (sitemaps), (2) link lists, (3) simple two-column tables used primarily for chronologies as well as art works and text describing them, and, (4) lexias containing primarily text, though some may also include thumbnail images linked to larger plates. Most text documents on this site contain two to four navigation links in the form of linked icons that appear at the bottom of each lexia plus multiple text links that weave the lexia into a miniature hypertext network. Although I find myself unable to formulate any rule as to proper number of text links, I have observed two things: (1) lexias approximately one to two screens in length tend to have at least three text links, and (2) as new documents arrive, older lexias receive additional links.

The comparative lack of text links observed in much web-based hypermedia also appears in much hyperfiction, as many authors seem uninterested in using more than single links, which create an essentially linear flow. Caitlin Fisher's *Waves of Girls,* a web narrative that won the 2001 Electronic Literature Organization (ELO) prize for electronic fiction, exemplifies the comparatively rare literary hypertext that includes both framing navigational links and others in the body of the text. Thus, in the following brief example, the phrases "I was so sad," "our principal," "grade 5 boys . . . ," "making out really meant . . ." all lead to—that is, produce—new text (Figure 23). In addition to the navigation links that appear at the left of the screen, the main text also contains frequent opportunities to follow links, which lead to other narrative arcs.

Following the Link Should Provide a Satisfying Experience. Linking in informational hypermedia obviously has to work in a clear, coherent manner, but what produces this requisite coherence?[4] In other words, what should appear
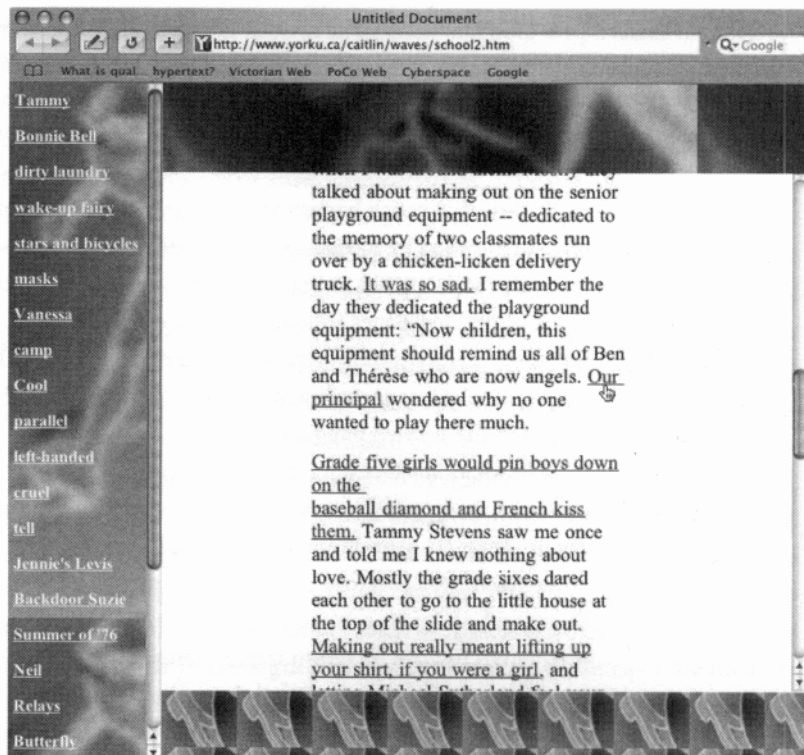
Figure 23. A Link-intensive Hyperfiction: Caitlin Fisher's *Waves of Girls*. In addition to the navigation links that appear at the left of the screen, the main text also contains frequent opportunities to follow links.

at the end of a link to satisfy the intellectual and aesthetic needs of the reader?[5] Let's take as an example what happens when one comes upon linked text in the midst of the following sentence in a lexia from *The Victorian Web* about the prose fantasies of William Morris: "Like John Ruskin, Morris creates prose fantasies permeated by his beliefs about political economics." What should one find at the end of the link attached to the name *John Ruskin*? For the reader of the present lexia, which discusses fantastic literature by Morris, the most useful link would produce a discussion of fantastic fiction by Ruskin, and in fact *The Victorian Web* has such a relevant document, "John Ruskin and the Literary Fairy Tale," one section of which explains the relations of his early fantasy to his later political writings. One might even hope that such a link would bring one to a comparison of the distinctive qualities of each author's writings in this mode, which this existing document does

not. All these desired link-destinations, one notes, are implied by the wording of the sentence in which the linked text appears.

What happens, however, when such discussions are unavailable? What usually happens both in the websites I've examined and those I manage is that the link of the compared author—here Ruskin—goes to very basic or general information about that figure. Notice that such a link to general information, which may provide a kind of basic identification of the figure for neophytes in the field, is not necessarily a bad link. In fact, for certain users, particularly those new to a certain field or subject, such a link destination might prove very useful. Still, most users of documents about quite specific topics require information that directly illuminates the main subject at hand (in this case, Ruskin's fairy tale). The fact is, though, that such specific link destinations are far more rare than the more general, glossary-type ones.

Obviously, one would prefer to give readers a choice of information, in this case providing both general and very specific information, in part because such a choice offers a richer, more user-centered embodiment of hypertextuality. Unfortunately, the World Wide Web, which at present allows only links from a word or phrase to a single destination, does not offer one of the most useful kinds of linking—the one-to-many or branching link that offers the reader a choice of destinations at the point of departure. One solution is to link the anchor—here "John Ruskin"—to another document, which has to be manually created, that offers multiple choices. Depending on the subject of the lexia in which this name appears, the link list or area sitemap at the end of such a link can take the form of lists of links to biographical information about "John Ruskin," those leading to his influence on various authors, and so on. Another approach to handling links to several destinations, not always possible to implement, requires adding phrases that might provide multiple anchors in the departure sentence. Thus, one could link general information to the figure's name (John Ruskin) and specific information only to phrases, such as "permeated by his beliefs," that lead the reader to expect a very specific discussion at the destination lexia.

The Pleasures of Following Links in Hyperfiction and Poetry. Since much hyperfiction and poetry aims to produce reader disorientation, however transient, the informational hypertext features of reader empowerment, multiple approaches, and clarity might not appear particularly important to it. Instead, the qualities of surprise and delight characterize such success, for with hyper-
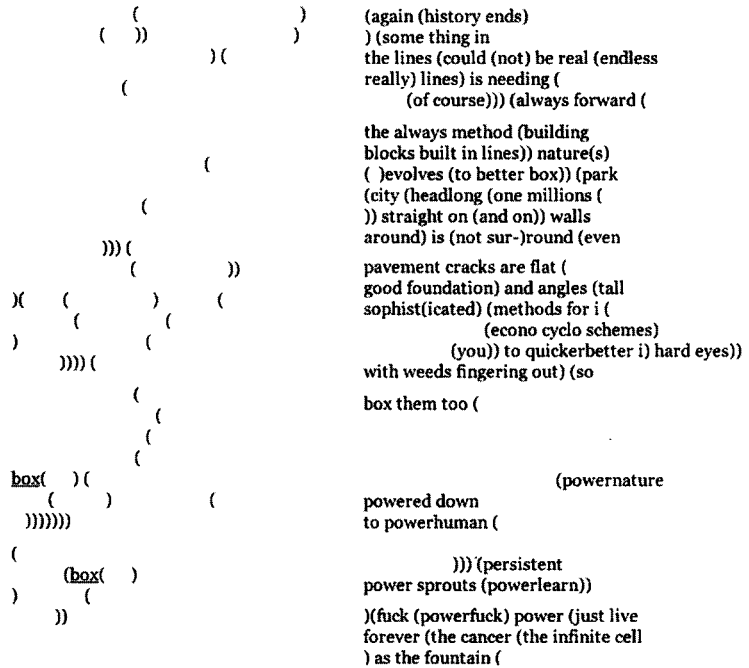
```
        (                    )        (again (history ends)
    (    ))              )            ) (some thing in
                 ) (                  the lines (could (not) be real (endless
         (                            really) lines) is needing (
                                          (of course))) (always forward (

                                     the always method (building
              (                      blocks built in lines)) nature(s)
         (                           ( )evolves (to better box)) (park
                                     (city (headlong (one millions (
      ))) (                          )) straight on (and on)) walls
         (            ))             around) is (not sur-)round (even

  )(   (        )     (              pavement cracks are flat (
      (            (                 good foundation) and angles (tall
  )              (                   sophist(icated) (methods for i (
      )))) (                             (econo cyclo schemes)
                                             (you)) to quickerbetter i) hard eyes))
         (                           with weeds fingering out) (so
           (
          (
          (                          box them too (
 box(   ) (                                              (powernature
     (    )        (                 powered down
   ))))))))                          to powerhuman (

 (                                           ))) (persistent
      (box(   )                      power sprouts (powerlearn))
  )     (
     ))                              )(fuck (powerfuck) power (just live
                                     forever (the cancer (the infinite cell
                                     ) as the fountain (
```

Figure 24. Two Stages of Reading and Ian M. Lyons's *(box(ing))*. At the left appears the screen one encounters early in one's reading; at right, the screen after the reader has brought forth words and phrases by clicking his or her mouse.

fiction and poetry the question must be, not does following the link chiefly satisfy an intellectual need but does following the link produce surprise and delight? Instances of such pleasing results of following links appear in Stephanie Strickland's *Vniverse* (see Figure 11) and Ian M. Lyons's *(box(ing))*, both of which produce text ex nihilo. When one moves one's mouse over a predetermined area (near a parenthesis in *(box(ing))* and within the night sky in *Vniverse*) and then clicks, text appears.[6] Thus, when the reader opens *(box(ing))*, little appears on the screen other than multiple gray parentheses scattered across a white background (Figure 24). Lyons explains, "The placing of the parentheses" was intended to "convey nested levels of associative meaning . . . arranged hierarchically; that is, if I opened one parenthetic set and then opened a second, this second set I always made to close before the first. For example: $(_1 \ldots (_2 \ldots)_2 \ldots)_1$." Lyons explains that "the piece's parenthetically obsessive syntax closely resembles that used in the entirely outmoded programming language, LisP (more recently reincarnated under the name Scheme)." Clicking on the screen within some parentheses and outside

others incrementally produces text. Lyons's poem, which he implemented in HTML, Storyspace, and Visual basic, was, he tells us, originally written to be read on paper with the intention of questioning "hierarchical modes of organization" found in post-Chomskian linguistics and implicitly confounded by hypertext, since, as Nelson has pointed out, the shortcomings of classification systems, all of which require hierarchies, explain the need of hypermedia in the first place.[7] The pleasures of reading *(box(ing))*, I propose, come from the discoveries of text the reader produces and of the meanings of that quite difficult text.

Stephanie Strickland's *Vniverse* (see Figure 11), a much more complex project than *(box(ing))*, represents a comparatively rare example of literary hypermedia that aims at producing both delighted surprise and the virtues associated with information hypermedia—reader empowerment and multivocality, or multiple approaches to a single general subject.[8] Upon opening *Vniverse,* one encounters a night sky—a black screen speckled with stars— in which the central portion rotates. A small circle appears at top right and a slightly smaller one appears diagonally opposite at lower left. Moving one's mouse across the sky halts the rotation and reveals various constellations. Meanwhile instructions scroll across the bottom of the screen: "Scan the stars . . . click once or click twice . . . click the darkness." Clicking on darkness brings forth a constellation, a particular star with its assigned number, and text that appears when one keeps one's mouse over the point at which one clicked. Typing a number in the top right-hand circle produces the star with that number and its surrounding constellation. Like many hypermedia projects that employ Flash and similar software, *Vniverse* boasts animated text. Unlike many such projects, it also emphasizes a high degree of reader control.

Coherence. Rich linking, plus a substantial degree of reader control, thus appear to characterize success in both informational and literary hypermedia. Another necessary quality, I propose, is some sort of crucial coherence.

Since hypertext fiction and poetry often employ disorientation effects for aesthetic purposes, coherent and relevant linking might not seem to be necessary, but I suspect it's simply that coherence not take as obvious forms as it does in information hypermedia. For example, our experience of reading pioneering hyperfiction, such as Michael Joyce's *afternoon,* proves definitively that much of what we have assumed about the relations of coherence to textuality, fixed sequence, and the act of reading as sensemaking is simply false. Reading *afternoon* and other fictional narratives

shows, in other words, that we can make sense of—that is, perceive as coherent—a group of lexias even when we encounter them in varying order. This inherent human ability to construct meanings out of the kind of discrete blocks of text found in an assemblage of linked lexias does not imply either that text can (or should) be entirely random, or that coherence, relevance, and multiplicity do not contribute to the pleasures of hypertext reading. Movement in *afternoon* from a lexia containing, say, the conversation of two men to one containing that of one of their wives may at first appear abrupt (and hence random or without any relevance), but continued reading establishes the essential coherence of the link between the two lexias: the movement between the one containing the men speaking and the second containing the women can be repeated, thus establishing a pattern like cinematic cross-cutting. Similarly, the next lexia one encounters can reveal that the words of one pair of speakers serve as the context, the backstory, for the others.

Coherence as Perceived Analogy. In linking, this necessary coherence can also take the form of perceived analogy—that is, the link, the jump across the textual gap, to some extent reifies the implied connection (implied link) found in allusions, similes, and metaphors. For an example, let us look at another early Storyspace narrative, Joshua Rappaport's *Hero's Face,* which shows how linking can serve as a new form of textual allusion. In *Hero's Face,* which relates the struggles for musical supremacy in a rock band, one particular link transports one from adolescent rock'n'roll to an entirely different, and very unexpected, world of ancient epic. Most of the story consists of lexias about the people in the band and the relationships among them. In one crucial lexia the narrator describes the first time he "climbed serious lead"—seized control of the music in midperformance—and realized that the experience resembles the feelings he has had while mountain climbing: "There comes a moment when all of a sudden you look behind you and you're out eight or ten feet from your last piece, which adds up to a twenty-foot fall onto the dubious support of some quickly-wedged chunk of metal in a crack—you look behind you, and it's just straight down, eighty or a hundred feet, and your belayer barely visible there at the bottom waiting for you to peel off—every muscle pumped up to bursting, as you realize that it is the mere strength of fingers and arms and your innate sense of balance keeping you up in the air." After readers encounter this comparison of musical improvisation to mountaineering, they come upon a link that functions as a second

analogy, for following this link brings one to the world of the Finnish epic, the *Kalelava:*

The old Vainamoinen sang:
the lakes rippled, the earth shook
the copper mountains trembled
the sturdy boulders rumbled
the cliffs flew in two
the rocks cracked upon the shores.
He sang young Joukahainen—
saplings on his collar-bow
a willow shrub on his hames
goat willows on his trace-tip
sang his gold-trimmed sleigh
sang it to treetrunks in pools
sang his whip knotted with beads
to reeds on a shore

Following Rappaport's link has several effects. First, readers find themselves in a different, more heroic age of gods and myth, and then, as they realize that the gods are engaged in a musical contest that parallels the rock group's, they also see that the contemporary action resonates with the ancient one, thereby acquiring greater significance since it now appears epic and archetypal. This single link in *Hero's Face,* in other words, functions as a new form of both allusion and recontextualization.

In hyperfiction, Michael Joyce invented this form of reified comparison or allusion when he had links transport readers from his story to passages from Plato's *Phaedo,* Vico's *New Science,* Basho's *The Narrow Road through the Provinces,* and poems by Robert Creeley and others. Perhaps the ultimate source here is Julio Cortázar's *Hopscotch* (to which Joyce alludes in the lexia entitled "Hop Scotch"). Frequently used, such juxtapositions-by-linking produce the kind of collage writing that appears to be very typical of hyperfiction and poetry.

Such combinations of literary homage to a predecessor text and claims to rival it have been a part of literature in the West at least since the ancient Greeks. But the physical separation between texts characteristic of earlier, nonelectronic information technologies required that their forms of linking—allusion and contextualization—employ indicators within the text, such as verbal echoing or the elaborate use of parallel structural patterns (such as

invocations or catalogues). Hypertext, which permits authors to use traditional methods, also permits them to create these effects simply by connecting texts. When successful, such linking-as-allusion creates a pleasurable shock of recognition as the reader's understanding of the fictional world suddenly shifts.

Does Hypertext Have a Characteristic or Necessary Form of Metaphoric Organization? The creation of coherence in linking via implied analogy can characterize not just the relation between two lexias but also an entire hypertext. The kind of textuality created by linking encourages certain forms of metaphor and analogy that help organize the reader's experience in a pleasurable way. Some of the most successful hyperfictions, such as Shelley Jackson's *Patchwork Girl,* employ powerful organizing motifs, in this case scars and stitching together that function as commentaries on gender, identity, and hypertextuality. Stitches and scars, which have obvious relevance in a tale involving Dr. Frankenstein and one of his monsters, become metaphorical and create unity and coherence for the entire assemblage of lexias. At an early crux in the narrative ("Sight"), Jackson creates a branching point at which the reader must choose between two lexias, both of which emphasize the analogous relationships among writing, reading a hypertext, and sewing up a monster ("written," "sewn"). Jackson's witty plays on these topics all have a role in a hyperfiction that exposes the way we create and experience texts, hypertexts, gender, and identity.

One can also create unifying metaphors or analogies that do not refer to hypertext, the medium itself. David Yun's *Subway Story* is a work of hyperfiction that employs metaphors that inform the narrative in "nonreflexive" modes. *Subway Story* employs the organizational metaphor of the map for the New York subway system: it includes both a map of that system and a lexia for each of its stations. Yun has created a lexia for every stop on the subway, and he has used the paths of the individual trains as link paths that create narrative arcs. As Stefanie Panke pointed out to me when I asked her why she thought it an example of good hypertext fiction, "*Subway Story* is an extraordinary hypertext because of the application of a spatial metaphor that allows a navigation that is somehow 'linked' to the story itself. It is a beautiful example for a metaphor that works because it is a part of (and not apart from) the storytelling."

Gaps. As should be obvious by now, good hypertext—quality in hypertext—depends not only on appropriate and effective links but also on appropriate and effective breaks or gaps between and among lexias. Terence Harpold long ago pointed out that Derridean gaps, the presence of which requires linking in the first place, have just as much importance in hypertext as do links them-

selves. N. Katherine Hayles has more recently explained that "analogy as a figure draws its force from the boundaries it leapfrogs across. Without boundaries, the links created by analogy would cease to have revolutionary impact" (93), and the same is true of the hypertext link. Without good—by which I mean effective and appropriate—separations one cannot have good links. Like the epic hero who requires an adequate antagonist to demonstrate his superiority, linking requires a suitable gap that must be bridged. We have all read hypertexts in which following a link produces a text that seems to follow what came before in such obvious sequence, the reader wonders why the author simply didn't join the two. We've all encountered relatively poor or ineffectual gaps by which I mean those breaks in an apparently linear text that appear arbitrary: the gap, the division between two texts, appears unnecessary when the link does nothing more than put back together two passages that belong together when no other paths are possible.

Hyperfiction and poetry can have two very different kinds of gaps, the first being those bridged or surmounted by links, the second being those that remain, well, gaps because nothing in the software environment joins the two texts or lexias. Whereas the first kind of gap, that joined by links, seems obvious because we encounter it every time we follow a link, the other is not. As an example of the second I am thinking of entire sections or narrative arcs in works like *Patchwork Girl* that remain separate and separated in the reader's experience and yet may be joined by allusion or thematic parallels. Thus, in *Patchwork Girl* gatherings of lexias about the stitched-together nature of the female Frankenstein monster reside in a different folder or directory than those comprising Shelley Jackson's collage of lexias composed of various texts from Jacques Derrida, L. Frank Baum, and Mary Shelley. These discrete sections join in variations on the themes of text, stitched-together-ness, coherence, origins, and identity. As this example of gaps unjoined by links makes clear, not all connections in effective hypertext require electronic connections—like nonhypertextual prose and poetry, hypertext also makes use of allusions, metaphors, and implicit parallels. The real question turns out to be, then, How does one decide when to make the potential connection, relation, or parallel explicit by means of an electronic link and when to leave connections, relations, or parallels implicit?

Individual Lexias Should Satisfy Readers and Yet Prompt Them to Want to Follow Additional Links. Hypertext is, after all, still text, still writing, and we find it difficult to distinguish many of the qualities of other good writing from writing with links. In other words, excellence in hypertext does not depend

solely on the link. To an important extent, the text that surrounds the link matters, too, because the quality of writing and images within an individual lexia relate to one key hypertextual quality—its ability to make the reader simultaneously satisfied enough with the contents of a particular lexia to want to follow a link from that lexia to another. The problem that any writer faces—whether the writer of hyperfiction or of stories intended for print— can be defined simply as how to keep the reader reading. Making readers want to continue reading seems much easier in print text for a variety of reasons: knowing the genre signals, readers know what to expect; looking at their place in a physical text, they know how much more they have to read; without choices demanded by linking, readers have essentially one choice— to continue reading or to put down the story, novel, or poem.

Particularly in these early days of the history of these new technologies and associated media, readers have a more difficult time deciding whether to keep reading. The text they read must persuade them to go on by the essential, traditional, conventional means—that is, by intriguing, tantalizing, satisfying, and above all entertaining them. In a hypertext lexia the reader must encounter text that is simultaneously, perhaps paradoxically, both satisfying and just unsatisfying enough: in other words, the current lexia readers encounter has to have enough interest, like any text, to convince them to keep reading, and yet at the same time it must also leave enough questions unanswered that the reader feels driven to follow links in order to continue reading. In the terms of Roland Barthes, the lexia must include sufficient plot enigmas or hermeneutic codes to drive the reader forward. This demand explains why the opening lexia of Michael Joyce's classic *afternoon,* perhaps the first and still one of the most interesting hyperfictions, takes the form of such ornate metaphorical prose. Here, for example, is the second paragraph in *afternoon's* opening lexia ("begin"):

octopi and palms of ice—rivers and continents beset by fear, and we walk out to the car, the snow moaning beneath our boots and the oaks exploding in a series along the fenceline on the horizon, the shrapnel settling like relics, the echoing thundering off far ice. This was the essence of wood, these fragments say. And this darkness is air. By five the sun sets and the afternoon melt freezes again across the blacktop into crystal

The rich, sensual metaphoric style of this lexia promises readers a lush reading experience and therefore makes them want to keep reading, but this section is also self-contained enough to cohere as a separate lexia. As anyone who has read *afternoon* knows, not all its lexias have this richness—some

Click on a face to follow a tale

Angelo	Clara	Doris
Only the clouds are solid~	Mirrors are so undependable~	Some men should be tethered~
Elizabeth	Gifford	Hank
It's time to pray to fireflies~	Invisibility has no cure~	Gravity is losing its grip~
Kevin	Rita	
Nothing satisfies like the moon~	Hasn't anyone seen my soul?~	Return to front cover

Figure 25. A Hyperfiction Sitemap: Jackie Craven's *In the Changing Room.*

are quite bare and brief—but Joyce does employ this style elsewhere, for example, in "Staghorn and starthistle."

The Reader Can Easily Locate and Move to a Sitemap, Introduction, or Other Starting Point. Can the reader easily return to documents or images encountered in a previous session? Such a requirement obviously pertains more to informational or discursive hypertext than to hyperfiction or poetry, though some fictions, such as Jackie Craven's *In the Changing Room* (Figure 25), employ a sitemap, in this case, consisting of the names of each of eight characters. Whereas Craven's sitemap takes the form of a typical HTML set of labeled links, Deena Larsen's *Stained Word Window* (1999; Figure 26) uses an active (or "hot") sitemap at screen left (on a black background) to bring up text at the right. Simply mousing over a word, such as "faces," "in," "understanding," or "windows," produces brief patches of free verse that contain links, and one can always return to the beginning or opening lexia because Larsen provides a linked footer icon that brings one back to it. Texts that invite a more active,

Stained Word Window

staring

Your · staring · at you
faces · corners
wholly · in · without
eyes · windows
Our · understanding · at us

staring

When we stop staring at you
do you turn and speak to each other,
running your lives in a completely
different way?
Or are you as indifferent to our eyes
as you are to the sun's voices?
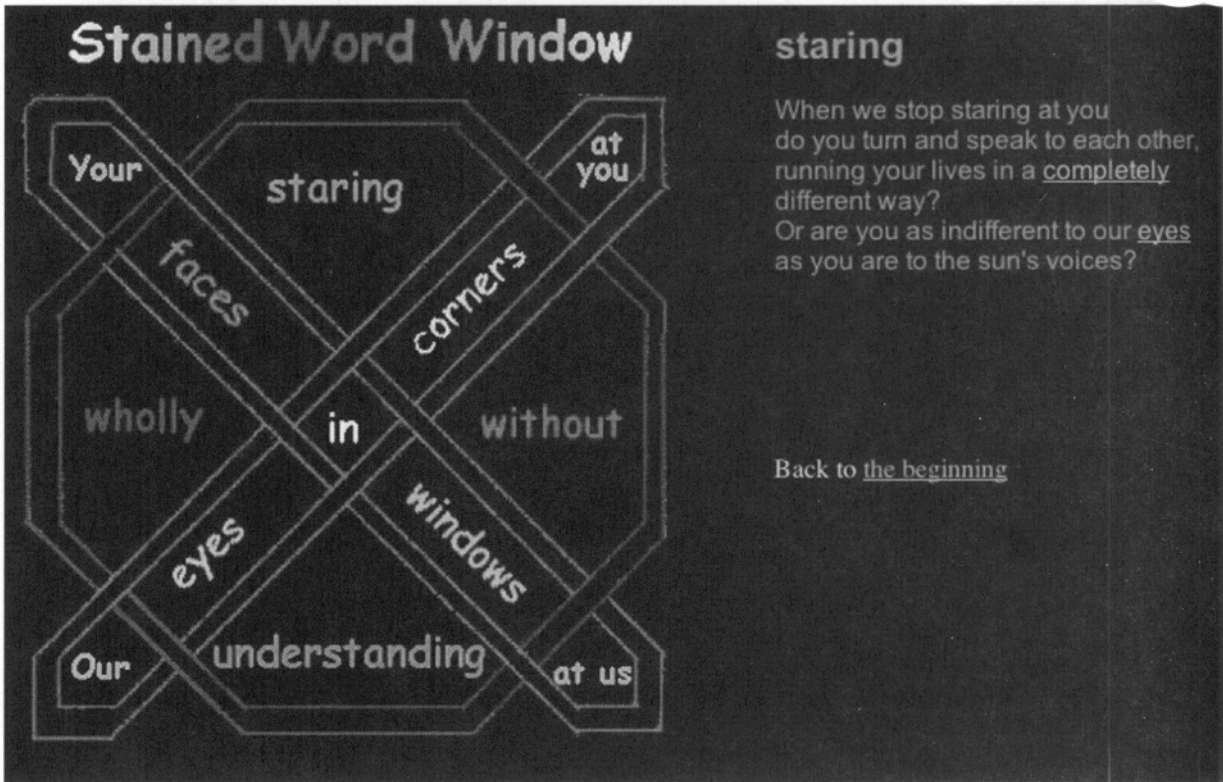
Back to the beginning

Figure 26. An Active Sitemap. Deena Larsen's *Stained Word Window* uses an active or "hot" sitemap: simply mousing over different portions of it makes poems appear at screen right.

even aggressive reader need, like informational hypertext, such devices, since the reader's orientation, rather than disorientation, plays a major role.

The Document Should Exemplify True Hypertextuality by Providing Multiple Lines of Organization. In a hypertext, whether fiction, poetry, or informational, one generally does not expect individual lexias to follow one another in linear fashion. True, linear sequences do have their use: Vannevar Bush–style trails require linear sequences, and authors of fiction use them to create a main (or default) axis for a narrative from which one can easily depart. Perhaps surprisingly, much hypertext narrative thus far takes the form of narrative loops or paths in which most of the lexias follow one another in a linear fashion, thus creating a series of self-contained stories. Of course, an electronic document may work quite well and yet not work hypertextually in any

complex or interesting way. One can, for example, have hypertexts in which linking only serves to join an index to individual sections. To be clear, let's remind ourselves that hypertextuality—or excellence in hypertext, whatever we decide that might be—obviously is important in judging a hypertext as hypertext, but it need not necessarily play an important role in other forms of digital arts and literature. Here I'm concerned only with the problem of quality in hypertext.

Steve Cook's "Inf(l)ections" and Jeff Pack's "Growing up Digerate" exemplify successful, richly linked discursive hypertexts. Cook's stands as experiment in new forms of academic writing whereas Pack's experiment autobiography provides three different kinds of organization that the reader can follow: (1) a linear path arranged chronologically, (2) a topic-driven reading facilitated by a sitemap in the form of an alphabetical list, and (3) a multilinear narrative provided by links scattered throughout the text of individual lexias. Jackie Craven's *In the Changing Room* similarly allows both linear narrative, permitting the reader to follow the story of a single character, or move among the eight characters, each one in effect being defined as a storyline, a narrative arc. As the introduction says, "Click on an underlined word, and the stories will merge and take new form. *Your path will not be straight.* Here in the Changing Room, all things are linked—and everyone is a reflection . . . of a reflection . . . of a reflection."

The Hyperdocument Should Fully Engage the Hypertextual Capacities of the Particular Software Environment Employed. In asking if an individual hypermedia project pushes the limits of the software it employs, one enters a minefield. In the first place, such a question implicitly assumes that the new, the experimental, has major value in itself, and even if one accepts this hypothesis, it might have validity only in the early stages of a genre or media form. Of course, at the present moment, all writing in hypertext is experimental since the medium is taking form as we read and write. Electronic linking, one of the defining features of this technology, can reconfigure notions of author, text, reader, writer, intellectual property, and other matters of immediate concern to those who design hypertext systems or author documents with them. Because hypertext fiction—writing at and over the edge—sets out to probe the limits of the medium itself, it acts as a laboratory to test our paradigms and our fundamental assumptions. A sample of hypertexts shows the ways they illuminate issues ranging from reader disorientation and authorial property to the nature of hypertext genres and the rules of electronic writing.

Within this project of writing-as-discovery, all elements in a hypertext

system that can be manipulated can function as signifying elements. To provide an example of the creative use of system features, let us turn to a few very early examples from *Writing at the Edge* (1994), all of which were created in Eastgate Systems' Storyspace, a stand-alone hypertext environment available for both Windows and Macintosh platforms.

In addition to containing traditional elements such as fonts, graphics, sound, and color, Storyspace also supports the creative utilization of "screen real estate"—the tiling of windows and the order in which they appear and arrange themselves. Nathan Marsh's lexias in *Breath of Sighs* place themselves around the screen, making the screen layout support the narrative as one crosses and recrosses the tale at several points (see Figure 22). Marsh's work, which dates from 1993, provided an early demonstration that writing had become visual as well as alphanumeric. It also reveals that a single software feature, such as the ability to control window size and location, leads directly to a particular mode of writing—here writing as collage and montage in which the multiple-window format permits readers to move back and forth among overlapping lexias. This feature also encourages active readers, since they can easily move about among lexias, thus creating a kind of spatial hypertext.

Several other hypertexts from *Writing at the Edge* show the imaginative deployment of another system feature of the software—the Storyspace view, a dynamic graphic presentation of the arrangement of document organization. Storyspace, a hypertext environment that also functions as a conceptual organizer, permits authors to nest individual spaces (lexias) inside others, or to rearrange the hypertext's organization by moving lexias without breaking links. Some works, like Shelley Jackson's *Patchwork Girl* (see Figure 28), take advantage of this graphic organizational feature to structure hyperfiction by means of separate folders or directories. Others, like Ho Lin's *Nicely Done*, arrange all lexias on a single level and indicate discrete narrative lines. This hypertext novel, which links a murder story and the events of a professional football championship game, suggests its organization by arranging its lexias, all of which appear on the top level, in four parallel lines. Timothy Taylor's *LBJ*—Lazarus + Barabbas + Judas—takes graphic indications of narrative and conceptual organization farther than Ho Lin's *Nicely Done,* arranging its lexias in the form of three crosses, the central one of which has a circle (halo?) over it. Here, rather than indicating the narrative structure, Taylor implies graphically something about the subject and theme of his fiction. Like similar projects that Michael Joyce reproduces in *Of Two Minds* (38), Adam Wenger's *Adam's Bookstore,* which I discuss in the following chapter, uses a circular deployment of the graphic elements representing lexias in Storyspace view to

indicate that his document can be entered—and left—at any point (see Figure 32). One of the most bravura examples of arranging lexia-icons in the Storyspace view appears in Marc A. Zbysznski's playful use of hundreds of them to create an image of a human face beneath a recycling symbol. Even the naming of lexias can provide opportunities for unexpected signification. Andrew Durden's playful arrangement of lexias in *Satyricon Randomly Generated* forms a grammatical sentence. Reading the titles of the upper-level folders reveals the following playful comment: "I / think this / lexia / is a good / start place." Stuart Moulthrop famously carried this playful use of system features much farther, creating sonnets within a menu of links!

As the previous examples suggest, hypertext environments have, if not precisely McLuhan's message in the medium, at least certain tendencies that derive from specific features of the software. The capacity to control size and location of multiple windows encourages collage-like writing that employs these features, just as the presence of one-to-many linking and menus of links that have a preview function encourage certain forms of branching. Both features and the limitations or constraints of these features encourage certain ways of writing, just as the fourteen-line sonnet encourages certain kinds of poetry.

Turning from Storyspace to HTML and the World Wide Web, by far the most widespread form of hypermedia today, one wonders if it, like other hypermedia environments, encourages certain modes of writing. HTML, which is basically an extremely simple text-formatting language that works on the Internet, has two defining features—first, the ability to insert links between lexias and, second, the ability to insert other media into individual lexias, originally just images but soon after sound, video, and animation created by Java scripts or Flash. The rapid spread of access to broadband connections to the Internet has transformed the World Wide Web from a simple system for linking text-representations into a multimedia platform. The implications of this change for anyone trying to determine the message in the medium are obvious: whereas earlier proprietary systems, such as Intermedia, Microcosm, HyperCard, Storyspace, Guide, and so on, had built-in, clearly defined characteristics, some of which provided clear limitations, the World Wide Web does not. Anyone working with basic HTML encounters certain obvious features, which may act as imitations. These include the absence of one-to-many linking, preview features, and preview functions, as well as the inability to place and control the size of windows. Anyone using Flash or Java in HTML documents, however, does not necessarily confront any of these limitations, though they may confront others, such as incompatibility with particular versions of

browsers. Such freedom, such absence of limitations, brings with it the relative absence of those restraints that often both limit and inspire creativity.

Conclusion. All forms of writing at their best can boast clarity, energy, rhythm, force, complexity, and nuance. Hypertext and hypermedia, forms of writing largely defined by electronic linking, are media that possess the potential qualities of multilinearity, consequent potential multivocality, conceptual richness, and—especially where informational hypertext is concerned—some degree of reader-centeredness or control. Obviously, hypertexts that build on the chief characteristics of the medium succeed. In addition, as we have seen, examples of hyperfiction and hyperpoetry reveal other sources of quality: individual links and entire webs that appear coherent, appropriate gaps among lexia, effective navigation and reader orientation, pervasive metaphoricity, and the exploration—and testing—of the limits of the medium.