text, once again in the form of the World Wide Web, serves a paradigm for our cultural experience with electronic writing. Hypermedia is multimedia hypertext, in which the defining characteristic remains the linking of presentational elements.

In revising this book, as I have noted, I have depended on the published work of many colleagues in literary hypertext and computer science, as the references indicate. In addition to drawing on their printed and electronic publications, I have also been privileged to know many, perhaps most, of the important figures in the field. I have benefitted from attending their conference papers and from e-mail discussions and private conversations. Many of them have shared with me their insights into and critiques of the first edition of *Writing Space*, and they have helped to shape my vision and correct my errors and excesses. They include Michael Joyce, Stuart Moulthrop, Nancy Kaplan, Jane Douglas, George Landow, Espen Aarseth, Terry Harpold, Janet Murray, Kate Hayles, and many other colleagues and students.

A final word regarding the reference system used in this edition. In addition to the standard references for printed works, included in parenthesis in the APA reference form, I have referred to Web sites by including the URL and (because Web site addresses can change arbitrarily) the date on which this URL was referenced. I have also included some internal references to indicate connections between various points in the text and to avoid repetition. The marker (=> p. 23) following a sentence indicates that the reader can find a related discussion on page 23. This is meant to be a printed version of a hyperlink, which seems to me appropriate for a book on hypertext. Richard Grusin and I first used the technique in *Remediation*. There is nothing radical about this technique of course, and it seems odd to me that a system of internal references is not used more often in contemporary books.

* * *

Bolter, J.D. (2001). Writing Space: Computers, Hypertext, and the Remediation of Print. Mahwah, NJ: LEA.

1

Introduction: Writing in the Late Age of Print

THE LATE AGE OF PRINT

In a well-known passage in Victor Hugo's *Notre-Dame de Paris*, 1482, the priest Frollo sees in the invention of the printed book an end rather than a beginning:

> Opening the window of his cell, he pointed to the immense church of Notre Dame, which, with its twin towers, stone walls, and monstrous cupola forming a black silhouette against the starry sky, resembled an enormous two-headed sphinx seated in the middle of the city. The archdeacon pondered the giant edifice for a few moments in silence, then with a sigh he stretched his right hand toward the printed book that lay open on his table and his left hand toward Notre Dame and turned a sad eye from the book to the church. "Alas!" he said, "This will destroy that" (Hugo, 1967, p. 197).

The priest remarked "Ceci tuera cela": this book will destroy that building. He meant not only that printing and literacy would undermine the authority of the church but also that "human thought … would change its mode of expression, that the principal idea of each generation would no longer write itself with the same material and in the same way, that the book of stone, so solid and durable, would give place to the book made of paper, yet more solid and durable" (p. 199). The medieval cathedral crowded with statues and stained glass was both a symbol of Christian authority and a repository of medieval knowledge, moral knowledge about the world and the human condition. The cathedral was a library to be read by the religious, the im-
who walked through its aisles looking up at the scenes of the Bible, the im-

ages of saints, allegorical figures of virtue and vice, and visions of heaven and hell (Yates, 1966, p. 124). In fact, the printed book did not eradicate the encyclopedia in stone; it did not even eradicate the medieval art of writing by hand. People continued to contemplate their religious tradition in cathedrals, and they continued to communicate with pen and paper for many purposes. However, printing did displace handwriting, in the sense that the printed book became the most highly valued form of writing. Philosophers and scientists of the later Renaissance used the medium of print to refashion the medieval organization and expression of knowledge. As Elizabeth Eisenstein has shown, the printing press has been perhaps the most important tool of the modern scientist (1979, especially pp. 520–574).

Hugo himself lived in the heyday of what we might call "the industrial age of print," when writers and publishers were taking advantage of mechanized presses to create mass-publication newspapers, magazines, and novels. Hugo's own popularity in France (like Dickens' in England) was evidence that such writers were reaching and defining a new audience. Today we are living in the late age of print. Word processing, databases, e-mail, the World Wide Web, and computer graphics are displacing printed communication for various purposes. In the 1980s, the computer and the printed book still seemed to serve different spheres of communication. Computers were well suited to scientific analysis and business data processing and possibly to forms of ephemeral writing, such as memos. Business letters and technical reports might also migrate to the computer, but literary, scholarly, and scientific texts of lasting value would remain in printed form. Now, however, the distinction between lasting texts and pragmatic communication has broken down, and all kinds of communication are being digitized. Major book publishers have for years put their texts in machine-readable form for photocomposition, so that even these texts pass through the computer on their way to the press. It now seems possible that many texts might never be printed, but simply distributed in digital form. The Internet and the World Wide Web have already expanded enormously the uses for digital communication: there are Web sites offering us Greek literature, avant-garde fiction, articles from medical journals, online magazines and newspapers, business materials and advertising for all kinds of products, and both written and visual pornography. Although print remains indispensable, it no longer seems indispensable: that is its curious condition in the late age of print. Electronic technology provides a range of new possibilities, whereas the possibilities of print seem to have been played out. As we look up from our computer keyboard to the books on our shelves, we may

be tempted to ask whether "this will destroy that." The question does not have a definitive answer. What is characteristic of the late age of print is, rather, that we pose the question.

The phrase "late age of print" no doubt makes many readers think of Frederic Jameson and many other neoMarxists who have characterized ours as the age of "late capitalism." For Jameson (1991), late capitalism does not mean dead capitalism; it means instead a changed system that operates globally through and around traditional governments and cultures (pp. xviii–xxi). Jameson writes, "[w]hat 'late' generally conveys is rather the sense that something has changed, that things are different, that we have gone through a transformation of the life world ... " (xxi). This is also the best way to think of the late age of print, as a transformation of our social and cultural attitudes toward, and uses of, this familiar technology. Just as late capitalism is still vigorous capitalism, so books and other printed materials in the late age of print are still common and enjoy considerable prestige, especially for the humanities and some of the social sciences. On the other hand, with the rapid decline of socialism, capitalism now seems to have no serious rival as an economic system. The printed book has a rival; indeed, it has had a series of rivals in the visual and electronic media of the 20th century, including film, radio, television, and now digital media. It is now defining how the printed book will function for our culture. Digital media are refashioning the printed book.

Because of the tension between print and digital forms, the idea of the book is changing. For most of us today, the printed book remains the embodiment of text. Both as authors and as readers, we still regard books and journals as the place to locate our most prestigious texts. Few authors today aspire to publish a first novel on the Internet (it is too easy); they still want to be in print. However, the printed book as an ideal has been challenged by poststructuralist and postmodern theorists for decades, and now the computer provides a medium in which that theoretical challenge can be realized in practice. Some groups (scientific researchers along with some in business and government) are already transferring their allegiance from the printed page to the computer screen. They think of the computer as their primary medium, print as a secondary or a specialized one. If our culture as a whole follows their lead, we may come to associate with text the qualities of the computer (flexibility, interactivity, speed of distribution) rather than those of print (stability and authority). As early as 1993, the historian Henri-Jean Martin was willing to claim that that shift in association had already oc-

cured: "Books no longer exercise the power they once did; in the face of the new means of information and communication to which we will have access in the future, books will no longer master our reason and our feelings" (quoted in Chartier, 1995, pp. 13).

It is certainly true that we no longer rely on print exclusively in organizing and presenting scientific and academic knowledge, as we have for the past 5 centuries. The organization of such knowledge now depends on the interplay of printed and electronic forms. The shift to the computer may make writing more flexible, but it also threatens the definitions of good writing and careful reading that have developed in association with the technique of printing. In the heyday of print, we came to regard the written text as an unchanging artifact, a monument to its author and its age. We also tended to magnify the distance between the author and the reader, as the author became a monumental figure, the reader only a visitor in the author's cathedral. In the late age of print, however, we seem more impressed by the impermanence and changeability of text, and digital technology seems to reduce the distance between author and reader by turning the reader into an author herself. Such tensions between monumentality and changeability and between the tendency to magnify the author and to empower the reader have already become part of our current economy of writing.

THE FUTURE OF PRINT

Our culture's ambivalence in the late age of print is reflected in the contradictory predictions made about the future of the printed book and of printed forms in general. The question has been the subject for volumes such as *The Future of the Book* (Nunberg, 1996). The enthusiasts for electronic technology are not ambivalent, and they sometimes predict the end of the book, as Raymond Kurzweil (1999) does:

... [E]lectronic books [of the early 21st century] will have enormous advantages, with pictures that can move and interact with the user, increasingly intelligent search paradigms, simulated environments that the user can enter and explore, and vast quantities of accessible materials. Yet vital to its ability to truly make the paper book obsolete is that the essential qualities of paper and ink will have been fully matched. The book will enter obsolescence, although because of its long history and enormous installed base, it will linger for a couple of decades before reaching antiquity (pp. 297–298).

Sometimes the enthusiasts simply ignore print as they go on to imagine an era of pure and transparent electronic communication, characterized by interactive audio and video or even networked virtual reality. For example, some educators imagine a classroom in which books are replaced by virtual environments:

Applications of virtual reality are being developed in such fields as architecture, medicine, and arcade games ... It is time to see how it could be applied to education and the development of virtual classes in the fullest sense as wraparound environments for learning where students as telepresences can see, hear, touch, and perhaps one day even smell and taste (Tiffin & Rajasingham, 1995, p. 7).

Nor are the critics of electronic writing always ambivalent. Some continue to insist on the division between literary and pragmatic communication—to argue that computers may be used for technical communication and for home entertainment, but that literature will continue to be printed. The novelist E. Annie Proulx claimed in the *New York Times* that "no one is going to read a novel on a twitchy little screen. Ever" (1994, p. A23). Taken literally, this claim is simply wrong. Such conventional novels as *Brave New World* and *Jurassic Park* have been digitized and read (or at least purchased) by an audience of hundreds or a few thousand. Such hypertext fictions as *afternoon* and *Victory Garden*, written exclusively for the twitchy little screen, have also won relatively small, but appreciative audiences. Proulx might be right, if we take her to mean that there will never be a mass audience for verbal fiction in this new medium, and in that case the scientific and literary communities would no longer share a space for publication or a forum for dialogue. Sometimes, too, critics will claim not to be Luddites, but only to be insisting on sensible limits to the computerization of culture; for example, Mark Slouka in *War of the Worlds: Cyberspace and the High-Tech Assault on Reality* (1995). Sometimes a critic will assert that no such limits are possible. In his *Gutenberg Elegies* (1994), Swen Birkerts assumed this fatalistic tone in discussing the eclipse of the printed book: "A change is upon us—nothing could be clearer. The printed word is part of a vestigial order that we are moving away from—by choice and by societal compulsion ... This shift is happening throughout our culture, away from patterns and habits of the printed page and toward a new world distinguished by its reliance on electronic communications" (p. 118). The inevitable was also lamentable: lamenting Birkerts spent much of his book, which was, after all, entitled an elegy.

menting the passing of the traditional literary culture that he associated with print.

The questions that concern both the enthusiasts and the critics include: What is the nature of the challenge that digital media pose for print? Will a digital media replace print? Does the advent of the computer announce a revolution in writing, or is the change less significant? Digital media may challenge traditions of writing at several levels. There is a challenge to print as a technology for delivering alphabetic text and a challenge to the genres and structures that we associate with printed books, newspapers, magazines, and so on. When Proulx complains about reading novels on "twitchy" screens, she assumes that the genre of the novel, which developed in the age of print, will continue to exist in its linear form and denies that computer screens will be the space in which such forms are read. She discounts the challenge that new electronic media might pose to the structure of fiction and nonfiction. In fact, linear forms such as the novel and the essay may or may not flourish in an era of digital media. Writers generally still write with a single, fixed order in mind, but the popularity of the World Wide Web and CD-ROM and DVD is leading some to exploring more fluid structures.

Digital media may also challenge alphabetic writing in any form—in a printed book or on a computer screen. Although printed books, newspapers, and magazines can and do combine graphics with text, new digital media seem often to favor graphics at the expense of text. If in the 1980s, the personal computer was a word processor, it has now become an image processor, which can manipulate and deliver static graphics, animation, and video (as well as audio). Computer graphics are refashioning conventional television and film. The question is whether alphabetic texts can compete effectively with the visual and aural sensorium that surrounds us. And if prose itself is being forced to renegotiate its cultural role, then the printed book is doubly challenged. It is not just that the computer as hypertext can challenge print as a mode of writing; it is also that the printed book is associated so strongly with verbal text. If prose loses its cultural warrant, then who will care about printed books, which are mostly prose? Can printed picture books hope to compete effectively with broadcast television and interactive video? Perhaps printed books will survive as the place for purely verbal texts and for that very reason be pushed to the cultural margin. Prose might in fact have a brighter future, if it could free itself from print technology. In electronic hypertext, for example, prose might combine with audiovisual presentation and perhaps share in the cultural prosperity of the image.

A whole set of cultural questions is connected with the changing status of the word. The importance of verbal literacy in education, the traditional canon, sex and violence on television, censorship in various media—these are all disputes over the appropriate balance between word and image. Much of what American conservatives think of as the "culture wars" is in fact an argument about modes of representation. The number and complexity of these questions suggest that we are at a critical moment in the history of writing. This moment is worth our consideration, no matter how the current tensions between print and digital technology are resolved in the coming decades.

Although it is very difficult to avoid all prediction (in practice, to avoid writing in the future tense), it should nevertheless be possible to resist the impulse to unify—to avoid merging individual predictions into a synthesis that is supposed to represent the one, true future. We should instead treat the predictions of both the enthusiasts and the critics as part of the ambiguous present that constitutes the late age of print. Their predictions reflect the struggles among various cultural factions that are trying to work out the relationship of digital technology to its predecessors. Although we need not try to decide whether the printed book will in fact disappear in 10, 20, or 50 years, we can try to understand the current relationship between print and digital media, which may show us why the future of the printed book seems so uncertain and the future of digital media so bright.

THE OLD AND THE NEW IN DIGITAL WRITING

In this late age of print, digital writing seems both old and new. Although we began in the 1980s by using word processors and electronic photocomposition to improve the production of printed books and typed documents, it has now become clear that we can use the computer to provide a writing surface with conventions different from those of print. A World Wide Web page already differs in some important ways from a conventional printed page. Electronic text takes on shapes that Web designers and other digital authors deem appropriate to the computer's capacity to structure and present information. In this respect authors and designers are performing the same service for electronic technology that printers performed in the decades following Gutenberg's invention.

As early as the 1450s and 1460s, Gutenberg and his colleagues were able to achieve the mass production of books without sacrificing quality, Gutenberg's 42-line Bible does not seem to us today to have been a radical

experiment in a new technology. It is not poorly executed or uncertain in form. The earliest incunabula are already examples of a perfected technique, and there remains little evidence from the period of experimentation that must have preceded the production of these books. Gutenberg's Bible can hardly be distinguished from the work of a good scribe, except perhaps that the spacing and hyphenation are more regular than a scribe could achieve. Because early printers tried to make their books identical to fine manuscripts, they used the same thick letter forms, the same ligatures and abbreviations, and the same layout on the page (Meggs, 1998, p. 63). It took a few generations for printers to realize that they could create a new writing space with thinner letters, fewer abbreviations, and less ink.

The parallel to Gutenberg's period can be overstated, however, for Gutenberg inaugurated the new age of print, rather than the late age of the manuscript. At its invention, the printed book seemed familiar and yet was in many ways new, whereas the computer seems utterly new and revolutionary, when, at least as a writing technology, it still has much in common with its predecessors. Electronic writing is mechanical and precise like printing, organic and evolutionary like handwriting, visually eclectic like hieroglyphics and picture writing. On the other hand, electronic writing is fluid and dynamic to a greater degree than previous technologies. The coming of this new form in fact helps us to understand the choices, the specializations, that the earlier printed book entailed.

Those who tell us that the computer will never replace the printed book point to the physical advantages: the book is portable, inexpensive, and easy to read, whereas the computer is hard to carry and expensive and needs a source of electricity. The computer screen is not as comfortable a reading surface as the page, so that reading for long periods promotes eyestrain. Finally—and this point is always included—you cannot read your computer screen in bed. However, electronic technology continues to evolve. Machines have diminished dramatically in size and in price during the past 40 years, and computer screens are becoming more readable. Some portable computers already have the bulk and weight of notebooks, and it is not hard to imagine one whose screen is as legible as a printed page. In fact, specialized devices styled as electronic books are already commercially available (=> p. 79). We can also envision a system whose flatscreen display is built into the top of a desk or lectern (like those used in the Middle Ages and the Renaissance), where the writer can work directly by applying a light pen instead of typing at a keyboard.

Ease of use is only one measure of a writing technology. The great advantage of the first printed books was not that you could read them in bed. Gutenberg might well have been appalled at the thought of someone taking his beautiful folio-sized Bible to bed. For generations, many important printed books remained imposing volumes that had to be read on bookstands, so that people often read (and wrote) standing up. Mass production by the letterpress did eventually make books cheaper and more plentiful, and this change was crucial. However, the fixity and permanence that printing seemed to give to the written word was just as important in changing the nature of literacy. By contrast, our culture regards digital texts as fluid and multiple structures. If this fluidity seems to offer new possibilities of expression, then writers and readers will put up with some inconveniences to use it.

In place of the static pages of the printed book, the computer can maintain text as a dynamic network of verbal and visual elements. Although writers have been exploiting these dynamic networks for two decades, as long as we are living in the late age of print, electronic writing will seem to be in its infancy. The electronic incunabula include computer-controlled photocomposition, the word processor, the textual database, the electronic bulletin board and mail, and now Web sites. Word processors already demonstrate the flexibility of electronic writing in allowing writers to copy, compare, and discard text with the touch of a few buttons. Change is the rule in the computer, stability the exception, and, as was already realized in the 1980s, it is the rule of change that makes the word processor so useful. On the other hand, most writers have enthusiastically accepted the word processor precisely because it does not challenge their conventional notion of writing. The word processor is an aid for making perfect printed copy: the goal is still ink on paper. Like computer-controlled photocomposition, the word processor is not so much a tool for writing, as it is a tool for typography. (On the interplay between fluidity and fixity in word processing, see Balestri, 1988; Heim, 1987; Mullins, 1988.) The word processor treats text like a scroll, a roll of pages sewn together at the ends, while its visual structures are still typographic. A conventional word processor does not treat the text as a network of verbal ideas. It does not contain a map of the ways in which the text may be read; it does not record or act on the semantic structure of the text. Other forms of electronic writing do all these things, making the text from the reader's point of view a texture of possible readings. They permit the reader to share in the dynamic process of writing and to alter the voice of the text.

REFASHIONING THE VOICE OF THE TEXT

Writing in the classical and Western traditions is supposed to have a voice and therefore to speak to its reader. A printed book generally speaks with a single voice and assumes a consistent character, a persona, before its audience. In today's economy of writing, a printed book must do more: it must speak to an economically viable or culturally important group of readers. Our culture has used printing to help define and empower new groups of readers: for example, the middle-class audience for the 19th-century British novel. But this achievement is also a limitation. An author must either write for one of the existing groups or seek to forge a new one, and the task of forging a new readership requires great talent and good luck. Even a new readership, brought together by shared interests in the author's message, must be addressed with consistency. Few publishers would accept a book that combined two vastly different subject matters: say, European history and the marine biology of the Pacific, or Eskimo folklore and the principles of actuarial science. It might even be difficult to publish a book that was part fiction and part nonfiction—not a historical novel, a genre that is popular and has a well-defined audience, but, let us say, a combination of essays and short stories that treat the same historical events. We might say that these hypothetical books lack unity. Yet our definition of textual unity comes from the published work we have read, or more generally, from the current divisions of academic, literary, and scientific disciplines, which themselves both depend on and reinforce the economics of publishing. The material in a book must simply be homogeneous by the standard of some book-buying audience.

This strict requirement of unity and homogeneity is relatively recent. In the Middle Ages, unrelated texts were often bound together, and texts were often added in the available space in a volume years or decades later. Even in the early centuries of printing, it was not unusual to put unrelated works between two covers (=> p. 77). On the other hand, it seems natural to think of any book, written or printed, as a verbal unit. For the book is already a physical unit; its pages are sewn or glued together and then bound into a portable whole. Should not all the words inside proceed from one unifying idea and stand in the same rhetorical relationship to the reader?

Our literate culture is choosing to exploit electronic technology in part to refashion the unified rhetorical voice of the text. Michael Heim (1987) has written, for example, that "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" (p. 220). An

electronic text may fracture the single voice of the printed text and speak in different registers to different readers. An electronic encyclopedia may address both the educated novice and the expert, just as the same corporate Web site may serve for general public relations, stockholder education, and even sales and marketing. In the ideal, if not in practice, an electronic text can tailor itself to each reader's needs, and the reader can make choices in the very act of reading.

Until recently, the printing press was a classic industrial machine, producing large quantities of identical texts. McLuhan (1972) called printing the first example of the assembly line and mass production (p. 124). Computer-controlled photocomposition has made printing more flexible, helping publishers to produce books more quickly and to target well-defined markets. However, hypertextual writing can go further, because it can change for each reader and with each reading. Authors can exploit the dynamic quality of hypertext to alter the nature of an audience's shared experience in reading. If all the readers of Bleak House or Ulysses could discuss these works on the assumption that they had all read the same words, no two readers of a hyperfiction can make that assumption. They can only assume that they have traveled in the same textual network. Fixed printed texts can be made into a literary canon in order to promote cultural unity. In the 19th and early 20th centuries, when the canon of literature was often taken as the definition of a liberal education, the goal was to give everyone the experience of reading the same texts—Shakespeare, Milton, Dickens, and so on. This ideal of cultural unity through a shared literary inheritance, which has received so many assaults in the 20th century, must now suffer further by the introduction of new forms of highly individualized writing and reading.

Critics accuse the computer of promoting homogeneity in our society, of producing uniformity through automation, but electronic reading and writing seem to have just the opposite effect. European and North American culture exploited the printing press as a great homogenizer of writing and of the literary audience, whereas that same culture now seems eager to use electronic technologies to differentiate genres and audiences as well as economic markets. In our current world of publication, electronic texts—Web sites, hyperfictions, CD-ROMs and DVDs for entertainment and education—are offered to us as fragmentary and potential texts, each as a network of self-contained units rather than as an organic whole in the tradition of the 19th-century novel or essay. This fragmentation need not imply mere disintegration, however. Elements in the electronic writing space need not

be simply chaotic; they may instead function in a perpetual state of reorganization, forming patterns that are in constant danger of breaking down and recombining. This tension may lead to a definition of effective writing that supplements or replaces our traditional notion of the unity of voice and of analytic argument. What unity there is in an electronic text derives from the perpetually shifting relationship among its verbal elements. What unity there is in the audience for that text comes from the momentary constellation of different economic and cultural "special interests."

REFASHIONING THE WRITING SPACE

In addition to redefining the voice of the text, our culture is also redefining the visual and conceptual space of writing. Indeed, the spatial metaphor for writing and reading is as culturally powerful now as it has ever been. Cyberspace has become a term for characterizing almost anything to do with the Internet or electronic communication. When we browse the World Wide Web, we think of ourselves as traveling to "visit" the sites, although in fact the servers are delivering pages of information to our computer. The Internet and the Web, CD-ROMs and DVDs, and computer RAM constitute a field for recording, organizing, and presenting texts—a contemporary writing space that refashions the earlier spaces of the papyrus roll, the codex, and the printed book. The continuous flow of words and pages in the book is supplanted in electronic space by abrupt changes of direction and tempo, as the user interacts with a web page or other interface.

Each writing space is a material and visual field, whose properties are determined by a writing technology and the uses to which that technology is put by a culture of readers and writers. A writing space is generated by the interaction of material properties and cultural choices and practices. Moreover, each space depends for its meaning on previous spaces or on contemporary spaces against which it competes. Each fosters a particular understanding both of the act of writing and of the product, the written text, and this understanding expresses itself in writing styles, genres, and literary theories. The writing space is also a space for reading, as Roger Chartier reminds us (Chartier, 1994, p. 2; 1995): communities of readers help to define the properties of the writing space by the demands they place on the text and the technology. For ancient Greece and Rome, the space for writing and reading was the inner surface of a continuous roll, which the writer divided into columns—not because papyrus had to be used this way, but because ancient culture made this choice. The space of the papyrus roll

defined itself in relation to earlier oral forms of communication and to stone or wood inscriptions (=> p. 77). For medieval handwriting and modern printing, the space was the white surface of the page, particularly in a bound volume, which was again a cultural decision of both the Latin and Byzantine Middle Ages. Initially, in late antiquity, the handwritten codex was in competition with the space of the papyrus roll and offered advantages that must have seemed important to contemporary readers. In the 15th century, the printed book defined itself in relation to the manuscript codex that it sought to displace. The space of electronic writing is both the computer screen, where text is displayed, and the electronic memory, in which text is stored. Our culture has chosen to fashion these technologies into a writing space that is animated, visually complex, and malleable in the hands of both writer and reader. In this late age of print, however, writers and readers still often conceive of text as located in the space of a printed book, and they conceive of the electronic writing space as a refashioning of the older space of print.

Because writing is such a highly valued individual act and cultural practice, the writing space itself is a potent metaphor. In the act of writing, the writer externalizes his or her thoughts. The writer enters into a reflective and reflexive relationship with the written page, a relationship in which thoughts are bodied forth. Writing, even writing on a computer screen, is a material practice, and it becomes difficult for a culture to decide where thinking ends and the materiality of writing begins, where the mind ends and the writing space begins. With any technique of writing—on stone or clay, on papyrus or paper, and on the computer screen—the writer may come to regard the mind itself as a writing space. The behavior of the writing space becomes a metaphor for the human mind as well as for human social interaction. Such cultural metaphors are in general redefinitions of earlier metaphors, so that in examining the history of writing, and in particular electronic writing today, we should always ask: How does this writing space refashion its predecessor? How does it claim to improve on print's ability to make our thoughts visible and to constitute the lines of communication for our society?