

**TEXT: The New Dialogue**

**BOOK: Writing Space**

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## THE READING PATH

A written text is a structure in space that implies a structure in time: writing turns time into space. In this respect a verbal text is like a musical score. The score is a visual pattern of bar lines, notes, rests, and dynamic markings, but the pattern only makes sense when read as sequence of measures. Most of us can read music, if at all, only by playing it on an instrument, but a good musician can read the score directly, activating the musical signs in his or her head. Those who can only read music by playing it are like people who read verbal texts by saying the words aloud: they are almost entirely absorbed by the unfolding temporal structure of the music. The good musician, however, can appreciate the second dimension, the “vertical” structure of the score as well. A thorough reading of text or music requires attention to the space as well as the time of the writing. And once again, the particular relationship between the time and space of the text depends on the writing technology used. In a medieval codex the spatial structure is the pattern of rubrication and various sizes of letters; in a printed book it is the arrangement into paragraphed pages; in the computer it is the pattern of textual windows and images on the screen. The temporal structure of a text is created by the reader’s moment-by-moment encounter with these elements.

If the reader is reading a story or an essay, the words create a rhythm of expectations. One word alludes to something earlier in the text or looks ahead to something to come. Expectations, explicit references, and allusions are also part of the purely oral arts of storytelling and public speaking. But the important difference between listening to a story and reading a book is that, while listeners simply allow the words to come to them, readers must themselves make the words move. What the reader sees on the page is a pattern of signs, and he or she takes in some portion of the pattern in each glance. Practiced readers of printed books take in whole words or phrases at a glance: their eyes make jumping movements that psychologists call “saccadic.” It is in the pauses between such jumps that a span of letters is viewed and recognized, (See, for example, Levin & Addis, 1979.) Beginning readers today (like most readers in the ancient world and early Middle Ages) focus on single letters and clusters and spell their way through each line. But whether the working unit is a single letter or an entire phrase, the reader’s task is to thread these units into a sensible order: to read is to activate verbal elements in time. The English “read” comes from the Anglo-Saxon ‘raedan’, which also means “to give counsel, to interpret.” This etymology reflects a belief that reading is a derived form of speech, that the reader is an interpreter who can make mute texts speak. The Latin word ‘lego’, which gives the Romance languages their words for reading (‘lecture’ in French, ‘lettura’ in Italian), has a more interesting etymology. ‘lego’ literally means “to gather, to collect,” while one of its figurative meanings is “to make one’s way, to traverse.” By this etymology, reading is the process of gathering up signs while moving over the writing surface. The reader on a journey through a symbolic space—this image, which fits all technologies of writing, is particularly appropriate to electronic writing.

To read is to choose and follow one path from among those suggested by the layout of the text. In confronting an ancient papyrus roll, the reader had few choices. The earliest ancient writing was strictly linear: it was simply a concentration of letters that the reader turned back into sound. In fact, some early Greek inscriptions were written in a style called ‘boustrophedon’ (“as the ox turns”), in which the line ran from left to right, bent around, and then continued from right to left with individual letters also drawn backwards. The technique was perfectly linear: the text defined letter by letter a continuous path for the reader to follow. At the other extreme are the numerous paths offered by the modern newspaper, in which several stories are laid out on each page and therefore compete for the reader’s attention. A printed encyclopedia lies between these extremes, since each article is meant to be read linearly, but the alphabetized articles themselves can be read in any order.

The codex and the printed book both allow the writer to suggest many paths through the same work. But in most paged books as in the papyrus roll, one path dominates all others—the one defined by reading line by line, from first page to last. The paged book has a canonical order. However, once that order is established, the writer may want to suggest alternatives. The writer may incorporate in the text references and allusions that cause the reader to jump back and forth, at least mentally, as he or she reads. The printed book makes these acts of reference easier through the use of footnotes and page references. A writer using a papyrus roll was more likely to repeat himself just

because it was hard to refer the reader back to a previous passage. In each writing technology and in each text, the question is: how and to what extent does the writer control the reader's experience of reading? To what extent does the reader actively participate in choosing his or her path through the text?

The question of control can also be posed in the absence of writing—in purely oral forms of storytelling and poetry. The Homeric poems, which we discussed as examples of oral composition in Chapter 4, have sophisticated structures of expectation and fulfilment. But, like all oral texts, they have no visible structure: nothing in Homer depends on holding a text in one's hands and moving back and forth through the copy. Homeric poets and modern storytellers do not create books. This means, above all, that there is no canonical order to the story. The storytellers tale is strictly linear, although it need not be fixed from one telling to another. The teller is free to deviate from the storyline without the fear that a written text will prove him or her wrong. There may be, as in Homeric poetry, a network of established heroes and their adventures, but that network can allow for additions and deviations. In fact, "deviation" is the wrong word: it is impossible for the oral poet to deviate from the path, because the poet makes the path as he or she goes. The story still has a temporal structure, a rhythm of expectations and fulfillments. The poet can digress from the main story and hold the audience in suspense, but the awareness of a tension between the fixed, visible text and the flow of spoken language is not available to oral poets or their audience. For example, there is nothing in storytelling that quite corresponds to the reader's sense that in turning the pages he or she is coming to the end of the book.

The Homeric storyteller chooses what events to tell and the pace of the telling, and the storyteller can adjust the tale in order to suit what he or she conceives to be the wishes of the audience. Since the storyteller and the audience are in immediate contact, the audience too has a measure of control over the telling of the tale. We can not say how Homer's original audience exercised that control; they may have shouted advice, or they may simply have shown greater or less interest as the performer proceeded. We know how modern children express their approval or disapproval of the way a story is told. In any case, writing changes the intimate relationship between the creator and the audience. It is no use shouting at a novel whose plot is heading in a direction we do not like: the book cannot adjust itself to our wishes as readers. In that sense the reader loses control. In other ways the reader is more powerful than the listener, since each reader determines the pace of his or her own reading and can at last try to change the path through the text by scanning or skipping a paragraph, a page, or a whole chapter. In nonfiction or anthologies of stories, readers can read the chapters or sections in orders other than the one suggested. (However, they do so at their peril; they must always be conscious that the book itself defines the preferred reading order.) In general it is harder to hoodwink a reader than a listener, because the reader can stop at any time, reflect, and refer to a previous section of the text. The difference becomes obvious whenever we have the chance to compare oral and written presentations of the same material. When a politician or a scholar speaks (reads a speech), it is harder to find the flaws. If we later read the text in a newspaper or in a journal, we may see nothing but flaws in the argument. Whenever we do have both the written text and an oral performance, we become aware of a tension between the two.

## PLATONIC DIALOGUE

Plato was acutely aware of the tension between oral and written discourse, and he created a genre of writing that both embodies and profits from that tension. Plato's dialogues combine the permanence of writing with the apparent flexibility of conversation. Each is the record of an impossibly artful philosophical discussion, and whatever its proposed subject, each dialogue is also about the difference between philosophy as conversation and philosophy as writing.

Plato's Socrates prefers conversation to writing. In the 'Phaedrus', he tells a story that seems to condemn writing as a vehicle for any true philosophy. Socrates and Phaedrus have been examining the nature of rhetoric and public speaking. Toward the end of the discussion, Socrates tells the story of the Egyptian god Theuth, a great benefactor of the human race. Theuth was an avid inventor, who gave us arithmetic, geometry, astronomy, draughts and dice, and the alphabet. The king of Egypt was another god named Thamus, and so Theuth took his inventions to the king and explained the purpose and value of each. Of the alphabet, Theuth said, "this invention... will make

the Egyptians wiser and will improve their memories, for it is an elixir of memory and wisdom that I have discovered” (See ‘Phaedrus’, 274E in Plato, 1919, p. 563). But the king replied that writing would have just the opposite effect: “...this invention will produce forgetfulness in the minds of those who learn to use it, because they will not practise their memory. Their trust in writing, produced by external characters which are no part of themselves, will discourage the use of their own memory within them. You have invented not an elixir of memory, but of reminding; and you offer your pupils the appearance of wisdom, not true wisdom” (275A, p. 563). Socrates goes on to explain that written words on a page are dead things. They cannot, as he puts it, answer questions we pose of them; they cannot explain themselves or adjust themselves to various readers. The process of adjustment and explanation is possible in philosophical conversation, the kind of questioning and answering that Socrates himself practices. The best writing, Socrates tells Phaedrus, is that of the living word, written in the mind of the student by a wise teacher, for this word is active: “it knows to whom it should speak and before whom to be silent” (276A, p. 567).

The ultimate failure of writing did not prevent Plato himself from becoming one of the most influential authors in the ancient world. However, it is true that Plato’s dialogue was a nostalgic form looking back to a time when Greek culture could do without writing. Plato lived in a period of transition in the history of literacy. Alphabetic writing was not new, but literacy had taken centuries to work its way into the fabric of Greek culture. By Plato’s time, children were going to school principally to learn to read and write, and the law courts were beginning to rely on written documents rather than hearsay. Plato understood that a whole way of life was finally passing, a way of life based on the spoken rather than the written word. (See Eric Havelock, 1982.) Nostalgia, however, is not the key for Plato: the key is rather the question of control in the new space that writing creates.

Platonic dialogue is a consciously literary attempt to imitate philosophical conversation. As the ‘Phaedrus’ points out, such conversation is spontaneous, capable of going in any direction in order to pursue a problem. And the dialogue itself seems to share that spontaneity: Plato appears to abdicate control of his text by reporting conversations between Socrates and his followers. Yet this apparent abdication gives Plato a subtler control over his reader. Plato leads and instructs his readers in the same devious way that Socrates leads and instructs his partners in the discussion—by getting them to acquiesce until they are too deeply involved in the argument to reject it. Still Plato the writer seems to envy Socrates the oral philosopher, because Socrates can adjust his questioning to his audience. He can guide his interlocutor along the proper path, securing agreement at each step. Plato as writer sets up his path, but he cannot be sure that the reader is following. The reader is free to make all sorts of misunderstandings that the text separated from its author cannot correct. The text cannot ensure that it will be read properly (in accordance with the author’s wishes), because the text no longer belongs to its author. For Plato, then, writing is both too rigid and too free. Readers too may feel the limitation of the dialogue: that they cannot truly enter into the staged conversation. They may be exasperated as Sorceress brings his audience to some particularly outrageous conclusion. Readers may want to break in and change the course of the discussion, but they would only be shouting at a text. What is true of all writing is painfully obvious in a dialogue; the form invites the reader to participate in a conversation and then denies him or her full participation.

#### FROM DIALOGUE TO ESSAY

A Platonic dialogue is a hybrid, a compromise between oral and written controlling structures. Such hybrids were common in ancient writing, where many genres were intended for oral performance—including speeches, dramatic and lyric poetry, and perhaps highly rhetorical history. Writers in these genres used structures that could be appreciated in reading aloud or in reading to others who do not have their own texts. So, for example, such early prose authors as Herodotus made use of a technique called “ring composition.” Herodotus would proceed to tell a story, then digress on an interesting detail, and then notify the reader/listener that he was resuming the original storyline. The narrative proceeded as a straight line with occasional digressive loops. In early ancient works of fiction and nonfiction, the dominant structure was usually the line. Plays took the reader step by step through events; history was written chronologically (with digressions). Early writing was paratactic; later, rhetorical writing became

periodic, favoring elaborate sentences with many subordinate clauses. But both the paratactic and periodic styles were oral, not visual: they depended for their effect on hearing rather than seeing the text. Gradually in the ancient world, forms developed that were remote from the oral performance: the treatise, the encyclopedia, the handbook. Poets began to offer books of short poems that could be sampled; historians and academics began to write essays on scholarly subjects. But, except perhaps in some branches of philosophy, ancient texts continued to be strongly linear. And the papyrus roll with its simple visual layout suited this linear structure.

After the invention of the paged book, linear structure of course survived. People still wrote narratives to be read straight through. The oral character of the text waxed and waned throughout the Middle Ages depending upon the genre. Heroic and lyric poetry was destined for performance; medieval encyclopedias, like their ancient counterparts, were designed to be consulted by single readers. In general, however, the new form of the book placed greater emphasis on the second visual dimension. It became more common to make hierarchical structures visible on the page by using different letter sizes and forms as well as different colors of ink. The invention of printing reinforced this trend. Printing standardized the table of contents, which is a hierarchical description of the contents of the book. As we saw in Chapter 2, hierarchy can be expressed in a tree diagram, and such diagrams appeared frequently in printed books from the 16th century on. (Sec Ong, 1958, pp. 74-83, 199-202, 314-318.) In the centuries following the invention of printing, the paragraph assumed its modern form both typographically and conceptually. And today all our major forms of nonfiction—the essay, the treatise, the report—are expected to be hierarchical in organization as they are linear in presentation. This is the paradigm for scholarly and scientific as well as business and technical writing. A scholarly essay should lead the reader step by step through its argument, making clear how each piece of evidence is relevant. The backbone of a technical report should be a careful outline of topics. Such an outline not only shows how each piece fits, but also directs the reader's movement through its parts. Whether we are told to write deductively or inductively, the result is still supposed to be a hierarchy of ideas and a carefully controlled reading.

This need to establish a hierarchy and to direct the reader is more than a matter of style; it now defines the professional activity of all academic writers. All scholarly research is expected to culminate in writing. The historian or scholar does research not for its own sake, but in order to have something to write. The same can be said of many of the social and even the hard sciences. And in order to be taken seriously, both scholarly and scientific writing must be nonfiction in a linear-hierarchical form. The historian's task, for example, is to establish causes and effects: to provide the reader with a consistent, analytical path through some aspect of history. The historian would not be allowed to offer two or more explanations that bore no relation to one another. An historian might argue, say, that the Roman Empire fell as the result of a combination of factors (economic stagnation, barbarian invasion, Christianity), but he or she would have to offer a plausible story, showing how each factor lent impetus to the others. Social or physical scientists set up controlled experiments in order to exclude all but one or a few factors. When they write up their results, the goal is to tell a simple story of cause and effect, although in today's complex sciences this ideal is seldom achieved. The point deserves emphasis: only the linear-hierarchical style of argument is permitted in orthodox writing today. And this orthodoxy is approved by and built into our institutions of learning and research.

If linear and hierarchical structures dominate current writing, the computer now adds a third, the network as a visible and operative structure. The network as an organizing principle has been latent in all written texts, and Homeric oral poetry shows that the network is older than writing itself. Established by repetition in the minds of both the poet and the audience, the Homeric network contained all the mythological characters and their stories. The poet drew upon that network to tell each tale. After the invention of writing in the ancient world, it became the writer's task to establish his or her own network comprised of references and allusions within the text and connected to the larger network formed by other texts in the culture. From that time until the advent of electronic writing, the referential network has existed "between the lines" of the text—that is, in the minds of readers and writers. Now the computer brings the network to the surface of the text. The computer can not only represent associations on the screen; it can also grant these associations the same status as the linear-hierarchical order. It is as easy for the reader to follow an electronic footnote as it is to scroll

to the next screen. The invisible network of associations becomes visible and explicit to an extent never before possible. (The network can never be fully explicit, however, because the verbal ideas of the textual always reach out beyond any given electronic text to all other texts that the writer and reader know.) The electronic writer still has available all the techniques of hierarchical organisation from the technology of print. He or she may still establish subordination and may still seek to define cause and effect. The electronic writer may embed hierarchical structures inside of larger networks, or networks inside of hierarchies. The line, the tree, and the network all become visible structures at the writer's and reader's disposal.

#### THE END OF THE LINE

"I generally approach a question not like this: x . . . but like this x . . . . I shoot again and again past it, but always from a closer position." (Wittgenstein in Baker & Hacker, 1980, p. 23)

Plato was unwilling to set out his philosophy as a treatise, as a linear progression in which the writer assumes overt control of the argument. Today, and for the last 200 years in the mature age of print, academic writers have been reluctant to accept any form other than the treatise. But if the printing press reinforced that attitude, the computer calls it into question. Why should a writer be forced to produce a single, linear argument or an exclusive analysis of cause and effect, when the writing space allows a writer to entertain and present several lines of thought at once? This question was posed before the invention of the computer by writers, who felt constrained by conventional structures in both fiction and nonfiction. Susan Sontag has observed:

"...a distinctive modern stylistics has evolved, the prototypes of which go back at least to Sterne and the German Romantics—the invention of anti-linear forms of narration: in fiction, the destruction of the "story"; in nonfiction, the abandonment of linear argument. The presumed impossibility (or irrelevance) of producing a continuous systematic argument has led to a remodeling of the standard long forms—the treatise, the long book—and a recasting of the genres of fiction, autobiography, and essay. Of this stylistics, Barthes is a particularly inventive practitioner." (Sontag, *A Barthes Reader*, 1982, pp. xiv-xv)

The French essayist Roland Barthes was indeed inventive in breaking down linear form. At every level, from the sentence to a whole book, his texts were characterized by fragmentation and interruption. His classic 'S/Z', for example, is a commentary on a short story by Balzac. A commentary is by nature a series of interruptions, and in this case Barthes' comments overwhelm the story and pry it apart, both typographically and conceptually. Barthes' writing is decadent in the sense that it is a decline or falling away from an ideal form of writing for the age of print. The great monographs of the 19th-century essayists and historians (Carlyle, Ruskin, Burckhardt) showed what printing could achieve; by comparison, Barthes is intentionally playful and perverse. These are traits he shares with such writers as Kierkegaard, Nietzsche, and Wittgenstein, each of whom in his own way attacked the development of systematic, linear argument.

Wittgenstein is a fascinating case. He was an influential teacher, who through his students defined the next generation of English linguistic philosophy. Like Socrates, he was a kind of antiauthor. Unlike Socrates, Wittgenstein did write, although he published little in his lifetime. At least in his later years, he agonized over the task of writing. He would fill notebooks with short, unconnected paragraphs, but when he sought to put these paragraphs together for what would become his 'Philosophical Investigations', he was stymied. Wittgenstein wanted to produce a conventional treatise. He tells us in his Preface that he had considered it essential to set his ideas "in a natural order and without breaks" (Wittgenstein, 1953, p. ix). But he found that...

"my thoughts were soon crippled if I tried to force them on in any single direction against their natural inclination.—And this was, of course, connected with the very nature of the investigation. For this compels us to travel over a wide field of thought criss-cross in every direction.—The philosophical remarks in this book are, as it were,

a number of sketches of landscapes which were made in the course of these long and involved journeys.” (p, ix)

Wittgenstein could not cast his philosophy in linear-hierarchical form; it had to remain a journey through a network of interrelated topics. This realization caused Wittgenstein more anguish than his Preface admits, and he often despaired of ever finishing his book (Baker & Hacker, 1980, p. 23). At one point he wrote: “The only presentation of which I am still capable is to connect [my] remarks by a network of numbers which will make evident their extremely complicated connections” (p. 24). Baker and Hacker believe that he actually intended to publish his ‘Philosophical Investigations’ as an interconnected network of entries. That is, he intended to number each entry and to indicate after each entry the numbers of other entries to which it was related (pp. 25-26). When the book was finally published, the entries were numbered, but Wittgenstein had abandoned the scheme of adding what we would call the links. (In writing their commentary on the ‘Philosophical Investigations’, however, Baker and Hacker have constructed diagrams to mark connections that they find.) At least for a time, then, Wittgenstein had conceived of the ‘Philosophical Investigations’ as a true hypertext. But, unlike Barthes, Wittgenstein was a prose innovator in spite of himself. His notion of a book was still determined by the old model, and he wanted very much to find a perfect order for his ideas.

Wittgenstein and Barthes rejected linear argument, but not the physical form, the “look and feel,” of the printed book. The reader picks up their books, opens to the first page, and reads in the conventional way. Some writers have extended their attack to the typography of the book itself, creating antibooks that disrupt our notion of how a book should look and behave before our eyes. ‘Glas’ (1974, 1976a) by Jacques Derrida is such an antibook. Each page of ‘Glas’ is divided into two columns: the left offers passages from Hegel with comments, while the right is a commentary on the French novelist Genet. Paragraphs set in and around other paragraphs and variable sizes and styles of type give the page an almost medieval appearance. There is no linear argument that spans the columns, yet the reader’s eye is drawn across, down, and around the page looking for visual and verbal connections. And the connections seem to be there, as words and sentence fragments refer the reader back and forth between Hegel and Genet. Thus, an isolated passage in the right column of the first page seems to be referring both to the text and to the reader’s response: “Two unequal columns, they say, each of which—envelops or encloses, incalculably reverses, returns, replaces, marks again, cross-links the other” (Derrida, 1974, p. 7; see also Derrida, 1976a). In ‘Glas’ Derrida lays down a textual space and challenges his reader to find a path through it. Whatever else he is doing, Derrida is certainly writing topographically, as if for a medium as fluid as the electronic.

Seven years earlier, in ‘Of Grammatology’ (1976b), Derrida was already drawing a contrast between linear and nonlinear writing. He argued that linear writing was “rooted in a past of nonlinear writing, ... a writing that spells its symbols pluri-dimensionally; there the meaning is not subjected to successively, to the order of a logical time, or to the irreversible temporality of sound” (Derrida, 1976b, p. 85; see also Jasper Neel, 1988, pp. 105-107). Nonlinear writing had been suppressed, though never eradicated, by linear writing. But nonlinear writing resurfaced in the literature of the 20th century, when it seemed that the modern experience could not be recorded in the linear way. Derrida concluded that a new form of nonlinear writing was possible, and this new writing would entail a new reading of earlier texts: “...beginning to write without the line, one begins also to reread past writing according to a different organization of space. If today the problem of reading occupies the forefront of science, it is because of this suspense between two ages of writing. Because we are beginning to write, to write differently, we must reread differently” (Derrida, 1976b, pp. 86-87). In all this, Derrida was prescient, but he could not know that electronic writing would be the new writing to which he alluded. Derrida suggested that “[t]he end of linear writing is indeed the end of the book” (p. 86). But instead the new electronic medium redefines the book in a way that can incorporate both linear and nonlinear form.

## THE NEW DIALOGUE

A work like ‘Glas’ provokes traditional readers, to whom it seems wrong or simply pointless to distort the printed page. In ‘Glas’ the network of relationships that nor-

mally remains hidden beneath the printed page has emerged and overwhelmed the orderly presentation we expect of a printed book. 'Glas' belongs in the electronic medium, where such relationships are perfectly at home. In computer writing any relationships between textual elements can float to the surface; the computer invites the writer to reveal the inner structure in the appearance and the behavior of the text. An antibook like 'Glas' would no longer be an antibook in an electronic edition, because it would work with rather than against the grain of its medium. 'Glas' requires the reader to take an active, even aggressive role in constructing the text, and in this way too it anticipates electronic writing. The computer medium encourages a writer to open a new kind of dialogue with the reader. This dialogue replaces the monologue that is the conventional printed essay or monograph. Like the interlocutor in a Socratic dialogue, the electronic reader assumes at least partial control of the argument. In an electronic encyclopedia, for example, the reader's queries determine what text will be retrieved and displayed: the queries cut a particular path through the network of encyclopaedic material. The encyclopedia has always tried to allow for this kind of interaction, but now the electronic medium allows essays and monographs to be structured as dialogues in this same way.

In a traditional essay, destined for publication, the writer speaks apparently in his or her own voice and is expected to take responsibility for a text that will go out to hundreds or thousands of readers under his or her name. Publishing is fundamentally serious and permanent, and it is for this reason that plagiarism in science or scholarship is taken so seriously. A scholar or scientist cannot even retract his or her own previously published argument without embarrassment. By contrast, a dialogue speaks with more than one voice and therefore shares or postpones responsibility. It proceeds by apparent indirection and may gradually zero in on its target. A hypertextual essay in the computer is always a dialogue between the writer and his or her readers, and the reader has to share the responsibility for the outcome. Instead of one linear argument, the hypertext can present many, possibly conflicting arguments. A hypertext on the fall of the Roman empire might include several explanations without seeking either to combine or to reconcile them. Instead of confronting a single narrative, the reader would then move back and forth among several narratives, each embodying one of the explanations. An academic historian would deny that such a hypertext is historical writing at all. But it is important to realise that the historian is judging by the standards of the conventional technologies of manuscript and print. Electronic writing threatens to redefine historiography in a way that reveals what Sontag has called the "impossibility or irrelevance of producing a continuous, systematic argument."

The same redefinition applies to all academic disciplines, in which scholarship is now understood as the producing of systematic argument for publication. There will no doubt be great resistance to such a redefinition, since there is already resistance even to the idea of publishing conventional scholarly journals electronically. In this new form of publication, journals would be offered as diskettes rather than printed volumes. The diskettes would be kept in the library, and printed copies of individual articles would be made locally on demand. No doubt some articles in specialized journals would never be printed at all. Electronic publication would allow the same access to information, but it would destroy the cachet of appearing in print. And traditional scholars rightly sense that the monumental, fixed quality of print is necessary to legitimize their arguments. For popular writing, the change should be less traumatic. Newspapers, magazines, guides, and how-to books are all less wedded to the permanence of printing. The idea of an interactive newspaper or video-magazine no longer seems radical at all. Computer communications services already allow the reader to dial in from a home computer and read articles from various published newspapers.

Eventually, the new dialectic structure of hypertext will compel us, as Derrida put it, to "reread past writing according to a different organization of space." Texts that were originally written for print or manuscript can not only be transferred to machine-readable form, but also translated into hypertextual structures. In some cases the translation would restore to these texts their original, conversational tune. Many of the texts of Aristotle, for example, are notes and excerpts from lectures that the philosopher delivered over many years; they were put together either by Aristotle himself or by ancient editors. For decades modern scholars have been trying to sort out the pieces. Printed editions make each text into a single, monumental treatise, but an electronic edition of Aristotle could record and present all the various chronological and thematic orders that scholars have found. This might be the best way for readers

to approach the carefully interwoven philosophy of Aristotle: following the electronic links would allow readers to sample from various texts and move progressively deeper into the problems that each text poses. This moving back and forth is the way that scholars reread and study Aristotle even now. The computer simply makes explicit the implicit act of deeply informed reading, which unlike casual reading is truly a dialogue with the text.

Rather than eliminating works of the past or making them irrelevant, the electronic writing space gives them a new “typography.” For hypertext is the typography of the electronic medium. A text always undergoes typographical changes as it moves from one writing space to another. The Greek classics, for example, have moved from the papyrus roll, to codex, and finally the printed book. When we read a paperback edition in English of Plato’s dialogues or Greek tragedy, we are aware of the translation from ancient Greek to a modern language. But we should also remember that the original text was without book or scene divisions, paragraphing, indices, punctuation, or even word division. All these conventions of modern printing are significant organizational intrusions into the original work. They make it easier to read Sophocles, but they change the Sophocles that we read. We would find it very difficult to read an English manuscript of the 14th century, or even an early printed book, because of the visual conventions. So it is not as if an electronic version will violate the sanctity of old texts for the first time: these texts have always been subject to typographic change.

When it comes to texts written in and for the electronic medium—and a few such texts have already been written—no translation is needed. The new works do not have a single linear order, corresponding to the pages of the book or the columns of the papyrus roll, and so there is no order to violate. It is precisely the lack of a fixed order and commitment to a linear argument that will frustrate those used to working with and writing for the medium of print, just as it will liberate those willing to experiment with a new form of dialogue. For writers of the new dialogue, the task will be to build, in place of a single argument, a structure of possibilities. The new dialogue will be, as Plato demanded, interactive: it will provide different answers to each reader and may also in Plato’s words know “before whom to be silent.”

**TEXT: Reading Images:  
Multimodality, Representation  
and New Media**

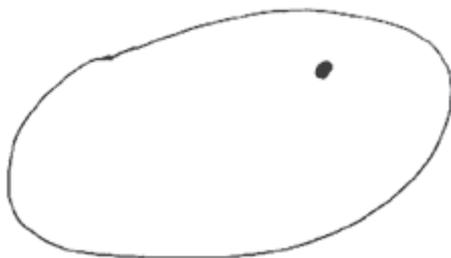
**AUTHOR: Gunther Kress**

## Reading Images: Multimodality, Representation and New Media

In this paper I wish to point to what I see as the central issues in the linked shifts in representation and dissemination: that is, from the constellation of mode of writing and medium of book / page, to the constellation of mode of image and medium of screen. In particular I will draw attention to consequent shifts in authority, in changes in forms of reading, shifts in shapes of knowledge and in forms of human engagement with the social and natural world.

Readers of this journal are experts in design. What I can offer is a particular take on certain issues in design from the perspective of (Social) Semiotics, and more specifically, from the perspective of multimodality, which deals with all the means we have for making meanings – the modes of representation – and considers their specific way of configuring the world. To make this concrete, here is a small example. Say I am designing a biology text-book. The subject matter is ‘plant-cells’. If I use words, I will have to say “Every cell has a nucleus”. If I use an image, I will need to place a large dot somewhere in the circle which indicates the cell to represent the nucleus (Figure 1).

*Figure 1. Cell and nucleus*



To reflect on this: in writing or speaking I have to use a sentence in which two entities – cell and nucleus – are related by a verb, have, indicating a possessive relation: the cell has something (much like: “I have a car, a house, two kids, etc”). I could use a different verb: “In every cell there is a nucleus”. The meaning is now quite different: about existence, there is and location, in. If I draw, I have to place a large dot representing the nucleus somewhere in a circle which represents the cell. Wherever I place it, someone looking at the image is entitled to assume that the nucleus actually is where I have placed it in the circle/cell – whether I intended to or not, or whether it actually belongs there or not. Each mode forces me into making certain kinds of commitments about meaning, intended or not. The choice of mode has profound effects on meaning, and textbook designers, for instance, need to be aware of such meaning effects of different modes.

Meanings are always disseminated through particular media: the medium of the book; or the medium of the CD-ROM, involving still and moving images, speech, writing, cartoon-like characters in comic strips, music, and so on. It might be the medium of the teacher’s body, involving speech, movement and gesture. All media offer specific possibilities to the designer, and to the reader/user in their reading and / or use.

The approach from Social Semiotics not only draws attention to the many kinds of meanings which are at issue in design, but the “social” in “Social Semiotics” draws attention to the fact that meanings always relate to specific societies and their cultures, and to the meanings of the members of those cultures. Semiotics takes the sign – a fusion of a form and a meaning – as its basic unit. In making signs we – embedded in our cultures – select forms in such a way that they express the meanings that we ‘have’ always ‘aptly’; hence signs always express, through their form, the meanings that the makers of signs have wished to make.

Take a simple example. I am in an American airport, looking for something to eat. I see a sign Bar and Grille, outlined in lurid red neon lights. Being hungry, I am attracted by “Grille”; I am aware that I am particularly drawn by the “e” on “Grille”. As a semioti-

cian – even a hungry one – I wonder about this “e”, in part because just the night before I have had a discussion with a colleague about how signs work. I order a brisket sandwich and think about this sign. What the “e” tells me is something about tradition and ‘Englishness’; it relates to many other signs I have seen where the “e” has had similar meanings, as in “Ye olde gifte shoppe”. And, even though I know it is a marketing gimmick, I want to be seduced by its meanings. Of course all the other parts of the sign also mean: the ‘Grill’ – with or without the “e” – speaks of barbeques, of the outdoors, of freshly cooked food. For the sauce I had the choice of mild, medium and make my day (– which I chose; and it did). “Bar” has its specific meanings for Americans reading the sign; and the lurid red neon sign of course ‘means’ to attract my attention, and maybe offer whatever promises ‘lurid red’, in the context of “Bar”, might hold.

All these are social meanings, specific to a particular culture. At the same time they are chosen, put together for their potential to mean, by the deliberate action of the designer. The sign – a complex message of words, of letters, of colour and font-types with all their cultural resonances – reflects the interests of its designer as much as the designer’s imagined sense of those who will see and read the sign. The sign is based on a specific rhetorical purpose, and intent to persuade with all means possible those who pass by and notice it.

### **Modes and their affordances: the materiality of modes**

The kinds of meanings made by the letter “e”, by the word “Grille”, and by the colour “red” are different kinds of meanings. Not only do they mean different things, they mean differently. You can’t look up the meaning of “e”, nor the meaning of “lurid red”. What “e” does is not so much refer to some object, such as a Grill, or a Bar, but rather to evoke by cultural associations. It has a history of use in particular places (in ‘marketing speak’ for instance), and it is knowing its provenance that gives it its meaning. “e” puts me in the world of ‘Olde England’ with all its mythic associations. In one sense, colours work similarly: I have encountered the colour ‘red’ in many instances, as in “red light district”, as a colour of lipsticks: so in this context it is eroticized. Words have their histories, but they also refer; they name things (as nouns) or actions (as verbs) or attributes (as adjectives) or as relations of location (as prepositions), and so on.

One of the present tasks of a social semiotic approach to multimodality is to describe the potentials and limitations for meaning which inhere in different modes. For that, it is essential to consider the materiality of modes. Speech uses the material of (human) sound; writing uses the material of graphic substance. There are things you can do with sound that you cannot do with graphic substance, either easily or at all; not even imitate all that successfully graphically. The up and down of the voice, which produces the melody of (English) speech, makes many meanings, from straightforward questions to highly modulated ones: imagine saying, in a tone of incredulity, “you did what?”; to many varying forms of emotion and affect. Even highly experienced writers find it impossible to reproduce these meanings in writing and need to take recourse to devices such as “... she said incredulously”. Maybe the major shift in the new landscape of communication in this respect lies in the increasing use of image, even in situations where previously writing would have been used. Consequently an urgent task is understanding the different affordances of writing and image.

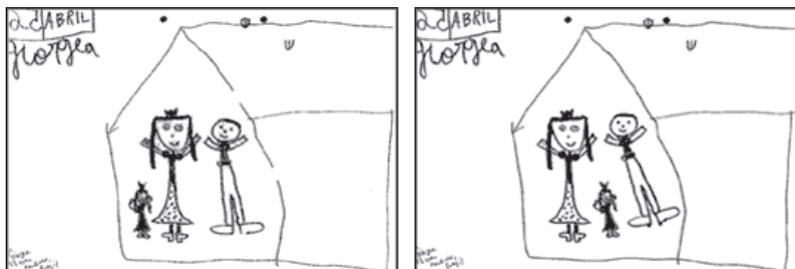
In alphabetic cultures writing tends to start, in words, grammar and syntax, as the transcription of speech. It quickly develops its own structures and forms (syntax, punctuation, layout, for instance), so that written English is now very different to spoken English; yet writing does ‘lean on’ speech. Speech happens in time: one sound, one word, one sentence follows another. The ‘logic’ of temporal sequence is the major principle of ordering of languages such as English. Speech and writing are organized by the logic and the ordering principle of sequence in time. This underlies the syntax of English, which is enormously more complex than mere sequence, but is there nonetheless. If I have two simple sentences, such as:

*The mists dissolved and the sun rose.* It matters in what sequence I place them.  
*The sun rose and the mists dissolved* is very different in meaning from  
*The mists dissolved and the sun rose.*

The one tells us how weather works; the other puts us in the magical, mysterious world of Lord of the Rings maybe. Sequence implies causality: the sentence which comes first seems to be causally prior to that which comes after. But notice that that is so whether I want that meaning or not: I cannot but order them in some way. If I have two friends, Amanda and Josh, and they have just got married, I might want to say either Amanda married Josh or Josh married Amanda; the two are different in causal terms – who was responsible for what. They are also different in terms of affective ‘proximity’: I may be closer to Amanda than to Josh, and so I place that person’s name first.

In speech as in writing we use words. Yet only that for which there is a word can be brought into communication: no word, no communication about it. In image, if there is something that we wish to depict, we can depict whatever we want. We don’t ask: “Is there an appropriate image we can use?” Contrary to common sense assumptions about language, words are vague. You have no doubt fully understood the sentences about Josh and Amanda, yet you know very little about either of them: how tall Josh is, what age Amanda, what colour hair they have, and so on. If you saw a photo of them, or even a drawing, much of this would be clear. Words are (relatively) vague, often nearly empty of meanings; by contrast images are full, ‘plain’ with meaning. With image the placement of the depicted entities relative to one another in the image-space is the principle used for making meaning. Take the two images below, drawn by the then four year-old Georgia.

*Figure 2a, 2b. Georgia at the side of her mother, and Georgia between her parents*



The difference in meaning depends on the relation of the depicted entities to each other in the frame of the picture-space: the resultant difference in Georgia’s sense of herself and her family is an effect of these spatial relations. In drawing the materiality of sound is not available for making, to indicate just how ‘being’ Georgia’s parents seem to her, instead the affordance of space is used – making things taller or shorter, broader or thinner. In fact, Georgia was quite a bit taller than she drew herself here; and her father was quite a bit shorter than her mother. Size here shows the metaphoric use of vertical extension: Georgia sees her parents as affectively /psychically much taller than they actually were; and she makes her father seem as tall as her mother by ‘lifting him off the ground’ somewhat. That leaves aside the meanings of colour.

One further point needs to be mentioned here; it follows from the distinct ordering principles of the two modes. The written text – as indeed the spoken – forces the reader (and the listener) to stick to its order: the elements have to be read in the sequence in which they occur. That is not the case, or far less so, with the image text. Yes, the elements are there in certain spatial relations, but how the reader reconstitutes them is largely up to the reader. The order of the written text is fixed; the order of the image text is (relatively) open.

### **Media and their interrelation with modes**

Modes and media exist in culturally and historically shaped ‘constellations’. The one that has dominated the alphabetic cultures of the ‘West’ over the last 300 years or so is

that of mode of writing with medium of book and page. Writing as mode and book as medium have shaped western imagination, forms of knowledge, practices of reading; the technology of writing has shaped the book, and the technology of the book has shaped how writing has developed. The traditional book represented the work of the author, who had laboured to produce a text, which in its ordering represented a 'body of knowledge' or the shape of the world – whether fictional or actual. Chapters in the book were coherent and complete in themselves; paragraphs had their logic; and sentences derived their form and purpose from the organization of the paragraph and the larger text.

In that world the reader's task was to attempt to follow the pre-given ordering of the written text, embodying the authority of the author, working assiduously to reproduce the meaning which the author had intended for the reader. In that world, authors could confidently speak and act on behalf of the reader, as did the author of the example in Figure 3, *The Boy Electrician*: "The prime instinct of almost any boy is to make and to create... At seven he will wire the whole house with his telephone system made from empty tins connected with varying lengths of string. His older brother will improve on that by purchasing a crystal, a telephone receiver, and a few pieces of insulated copper wire..." (p 5)

Figure 3. Spread from "The Boy Electrician"



Certain texts – novels for instance – encourage the reader to engage in the semiotic work of imagination, following the given order of words on the line but filling the relatively 'empty' words with the reader's meaning. Contemporary texts – whether information books of all kinds, web-pages, the screens of CD ROMs, and so on – in their increasingly often image-like textual organization, ask the reader to perform different semiotic work, namely to design the order of the text for themselves. Consequently two phenomena are now becoming noticeable, as in Figure 4, which had been present but never noticed before: the entry point of the 'page' and its reading path.

Figure 4. Home page of the University of London Institute of Education (www.ioe.ac.uk)



The page of *The Boy Electrician* has one entry point, at the top left of the page; it had long become naturalized and therefore was no longer visible. Nor was the reading path: it asked the reader to follow the lines, in the order in which the culture had determined. The page/screen in Figure 4 has, by contrast, about 13 entry points. The reader[’s] interest determines where he or she wishes to enter the page. The same applies to the ‘reading path’ which the reader (now usually called a ‘visitor’) wishes to construct: it too is determined by the reader’s interest.

For design this is a crucial factor, and a profound change. The designer of such ‘pages’ / sites is no longer the ‘author’ of an authoritative text, but is a provider of material arranged in relation to the assumed characteristics of the imagined audience. The power of the designer is to assemble materials which can become ‘information’ for the visitor, in arrangements which might correspond to the interests of the visitor. For the visitor however “Information is material which is selected by individuals to be transformed by them into knowledge to solve a problem in their life world” (Boeck, 2002)

### **Making texts and reading texts**

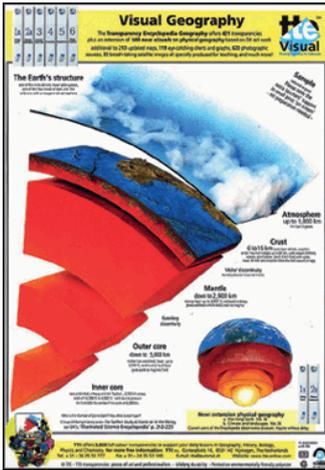
In the conception outlined here, the processes of making texts and reading texts are both [...] processes of design; and both are in [an] important sense inversions of the social and semiotic arrangements of the era of the dominance of the constellation of writing and book. It has now been overtaken by the new constellation of image and screen. The (at least mythically) dominant media are now those of the screen – whether of the Gameboy, the mobile telephone, the PC, or still the TV and video. The book and its page had been the site of writing and the logic of writing had shaped the order of the page and the book; the screen is the site of the image and the logic of the image is shaping the order and the arrangements of the screen.

Writing can appear on the screen; but when it does it is subordinated to the logic of the image; just as image could appear on the page, though subordinated to the logic of writing. The [image logic] will more and more shape the appearance and the uses of writing, a process which is already apparent in many instances of public communication. In the former arrangement, the figure of the author and the mode of writing dominated; in the new arrangements the designer and the mode of image dominate; the story-board is an apt metaphor for this change – image led, and very often the product of a design-team.

### **Design as choice in context**

In the multimodal landscape of communication, choice and therefore design become central issues. If I have a number of ways of expressing and shaping my message, then the questions that confront me are: which mode is best, most apt, for the content / meaning I wish to communicate? Which mode most appeals to the audience whom I intend to address? Which mode most corresponds to my own interest at this point in shaping the message for communication? Which medium is preferred by my audience? Or by me? How am I positioning myself if I choose this medium or this mode rather than those others? All of these call for choices to be made, resting on my assessment of the environment in which communication takes place, in all its complexity, in its widest sense, in which a commodity – the smell of my shampoo, the packaging of the bag of flour, the shape of the bottle of soft-drink – are all ‘messages’ to interpret. The question of choice is illustrated by the contrast of say, Figure 3 with Figure 4, or of Figure 3 with Figure 5.

Figure 5. Visual geography-tectonics



The page in Figure 3 is the realization of choices – of stylistic choices in relation to writing, choices of font (though for any one publishing house there might not have been choice), the framings of the text through syntax (marked by punctuation) and in text (marked by paragraphing, for instance), and by layout in spacings, as well as the frame around the ‘densely printed page’ (Reading Images, 1996). However, these choices had nearly faded into invisibility through the two aspects of habituation and convention. By contrast, the page in Figure 5 shows a plethora of choices made and realized through the modes of writing, layout, colour, and image.

Design is a prospective enterprise. The question it asks is: “what, in this environment, with this kind of audience, with these resources that are available for implementing my design, given these social, economic, ‘political’ constraints, and with my interests now at this moment, is the best way of shaping that which I wish to make, whether as ‘message’ or as any object (of design)?” Here, briefly, are two examples, showing choices made and interests expressed. Figure 6 is the result of the request of the teacher of a class of six year-olds to “make me a drawing and write me a story of our trip to the British museum.”

Figure 6. Notes from a trip to the British Museum

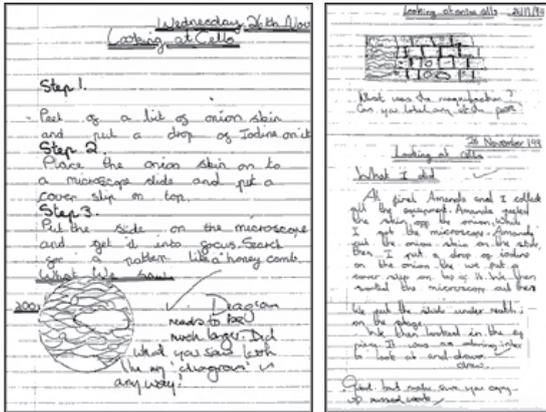


The different ‘take’ on the representation of the day in writing and drawing is startling (all the images and stories showed this contrast): salient object-entities in spatial relation in the visually represented world, contrasted with salient events/actions in temporal relations. We might dismiss this as childish representation. Or we might say that these six-year olds are using the two modes of writing and image in line with their inherent affordances – the (transformed) recollection of the visually encountered world through the spatially organized mode; and the (transformed) recollection of the actionally experienced world through the temporally organized mode. If we take that ap-

proach we see that the children have made apt use of the affordances of each mode. The facts of the representational world are certainly moving in the same direction.

In the next example two modes co-exist in one integrated textual object, the question is the same one: what are the principles for the use [of] the modes (the question of “principled use” can and needs to be asked of all my examples). At the end of four lessons on ‘plant cells’, the teacher had asked the 14 year old students, working in groups of four, to prepare a slide of the epidermis of an onion, look at it through a microscope, and then “write what you did” and “draw what you saw”.

Figure 7a, 7b. Eye-piece of the microscope, and Cells as a “brick wall”



The teacher had given two additional instructions: “put your writing at the top of the page, and the drawing at the bottom”, and “use only black pencils in your drawing”. Apart from the different responses to this instruction (7 b used colour pencils) there is the startling difference in what each “saw” and what each wrote. One written text is a recount, the other a procedure. The recount, generically speaking, says: “this is what happened”; the procedure, generically speaking, says: “this is what ought to happen”. The drawings differ equally profoundly. One declares “this is what theory tells us is the case” (on a worksheet there had been a comment “what you should see is something like a brick wall; each cell is a brick”); the other declares “this is what I actually observed and recorded”. The first is the “truth” of theory; the second is the “truth” of the empirical, reliably recorded.

The question of design is in the center here. The matter at issue is of course ‘plant cells’; but maybe even more than that it is: “what is it to be scientific?” In each case the answer is broadly the same (though differently realized modally): “to be scientific is to adhere to the “truth” of theory”. In Figure 7 a, the student lodges the “truth” of the facts of the empirical world in the drawing, and the “truth” of theory through the replicability of scientific practice in the written text. In Figure 7 b, the student lodges the “truth” of scientific theory in the drawing, and the “truth” of actual practice in the written. In each case event-like representation uses the mode of writing; and the representation of object-entities is lodged in drawing.

### Design as a part of rhetoric of communication

The contemporary social world is marked by increasing fragmentation and individuation (Beck, 1986); in stark contrast to the world of the 19th and early 20th century, the world of stable structures and of individual integration and definition in those structures. Strong frames, and integration into strong frames had their analogues in communication through stable genres, and through stable modal ‘choices’. In periods of stability the question of effective communication is answered by the idea of convention and of competent action in relation to those conventions. In periods of fragmentation and individuation communication is fraught: each environment of communication asks that social and ‘political’ relations, tastes, needs and desires be newly assessed. The question of rhetoric – how to make my communication most effective in relation to this audience, here and now - has moved newly, urgently into the center. Rhetoric has become a major issue for design.

**TEXT: Cybertext**

**AUTHOR: Espen Aarseth**

(Summary by Axel Vogelsang)

Aarseth, E. J. (1997). *Cybertext*. Baltimore: The Johns Hopkins University Press.

Espen Aarseth's *Cybertext* is probably one of the most interesting texts in media theory in the recent years. What makes this text so exciting is that it opposes itself to a lot of the 20th century literary theory: structuralism, poststructuralism and semiotics. Aarseth's very specific and original viewpoint is most likely related to his background in video game studies and electronic literature, both domains, which put a lot of emphasis on the technical medium. To him, the shortcoming of structuralism is that it treats any text as a sequence of signs, irrespective of the reader's position or the material that is read from. Poststructuralism on the other side overemphasises the position of the reader, the process of reading and interpretation, thus turning the reader into an author. While questions of meaning are at the center of both theories, the actual mechanics of reading are neglected, as a text according to those schools of thought is linear per se and the path of reading is predefined. Particularly poststructuralism actually criticizes the linearity which it thinks is at the core of the medium book.

Aarseth points the attention to the element that has been mainly ignored by these schools of thought, the materiality of the text itself. His focus is not on "what was being read" but "what was being read from". He points out that it is not only the act of reading and writing that produces a text but also the performance of the material itself. All texts perform and in digital media the text can even perform partially or wholly without either the reader or the author. Accordingly Aarseth describes text as a "mechanical device for the production and consumption of verbal signs". In that sense the book is not linear at all. Aarseth highlights the fact that reading paths through a book are actually less linear and predefined as they are in a hypertext. A hypertext has much stricter rules regarding the accessibility of certain parts of text at a given moment.

So what is a Cybertext then? There has been some controversy about its exact meaning and particularly about the term ergodic literature. (see the respective discussion on GrandText Auto) The way I understand the term Cybertext it is meant as a specific perspective on text. The label does not apply to digital media only as, by the sounds of it, one might think. Nor does it try to deepen the trenches along the lines of old and new, digital and analog, linear and non-linear, interactive and non-interactive or whatever terminology might be used to describe the changed modalities of text. It is an effort to give consideration to a wider dimension of textuality and to open up the discussion by adding a new perspective regarding the performance of the text. This performance includes the possibility of a physical rearrangement of the text elements, the scriptons. This construction of a very specific sequence of signs goes much further than the idea of just different readings, which structural and poststructural literary theory concentrate on. But Aarseth also points out that there are "trivial" and "non-trivial efforts" in the construction of such a sequence. The turning of the pages of a book for example would be seen as a trivial effort. This doesn't rule paper or other analogue media out as carriers of Cybertext. Aarseth explicitly refers to printed works such as the I-Ching or Queneau's *Cent Mille Millions de Poèmes* as falling into this category.

One could argue that it is the interaction with the text that Aarseth is interested in. But interaction does not discriminate between trivial and non-trivial action, which is why Aarseth doesn't give it much further consideration. He defines his own list of qualities defining the workings of the text as a material:

**Dynamics:** describing the possible changes in the amount and content of text elements. **Determinability:** describing the flexibility in the relationship of the text elements to each other. **Transiency:** describing the ability of a text to change without the user's intervention. **Perspective:** does the text force the user take on a specific perspective (play a specific role) such as a character in a role playing game? **Access:** how much of the text is accessible at any given time? **Linking:** if specific text-elements are linked to each other how are these links defined? **User-functions:** What are the activities that the user has to undertake to support the performance?

Those categories show that the user to some extent participates in the arrangement of the text, and thus reading is more than just the extraction of meaning out of a pre-defined semiotic sequence. However, according to Aarseth, there is no way the user can claim authorship which is one of the main propositions of poststructuralist theory. Ergodic literature, at least in my understanding of the term, describes a form of literature where the user moves through a text by acting on it and through a form of non-trivial effort, always restricted to the amount of freedom and the set of rules pre-defined by the author (p. 89). So, contrary to poststructuralism, Aarseth claims, that these predefined parameters of reading are an essential part of authorship rather than a way of handing authorship to the reader.

A few quotes from *Cybertext*:

*Cybertext*, as now should be clear, is the wide range (or perspective) of possible textualities seen as a typology of machines, as various kinds of literary communication systems where the functional differences among the mechanical parts play a defining role in determining the aesthetic process. Each type of text can be positioned in this multidimensional field according to its functional capabilities...As a theoretical perspective, cybertext shifts the focus from the traditional threesome of author/sender, text/message, and reader/receiver to the cybernetic intercourse between the various participant(s) in the textual machine. (p. 22) For semiotics, as for linguistics, texts are chains of signs and, therefore, linear by definition (Hjelmslev 1966, 30). As Tomás Maldonado (1993, 58-66) argues in his excellent essay on virtual reality, semiotics (with particular reference to the work of A. J. Greimas) has not managed to meet the challenge from "a whole typology of iconic construction, very different from those studied by semiotics until now." The new constructions consist of "interactive dynamic" elements, a fact that renders traditional semiotic models and terminology, which were developed for objects that are mostly static, useless in their present, unmodified form. (p. 26) The fundamental question, however is whether a system capable of producing emergent behavior based on an initial state and a set of generative rules should be considered a semiotic system at all. Since it can exist without any semiotic output, as a closed process running inside a computer, the semiotic aspect is clearly arbitrary and secondary to the process itself. To the researcher, the semiotic aspect is indispensable as a front end, a practical means to observe and gain knowledge of the evolutionary process going on inside, but this does not imply that the process is basically a semiotic one or that the studied object should be classified as a sign, only that the activity of observation by necessity has to involve a semiotic system of some sort. (p. 31)