Hypermedia and Synesthesia

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Synesthesia is a central conception in Marshall McLuhan's exploration of the relationship between media, culture, and the human sensorium. Jay David Bolter claims synesthesia as one of the effects achieved by hypermedia. However, McLuhan's notion of synesthesia as the simultaneous interplay of the senses in a ratio fostered by the particular medium or media involved is missing in the theoretics of hypermedia, which relegates all sensory phenomena to visual terms and overlooks the interplay between orality and literacy. Research into synesthesia in art, culture, language, and cognition supports McLuhan's conception of it as the normal process by which the brain reaches a new equilibrium when one of its functions is outered in a technology. While hypermedia thankfully falls short of mimicking natural synesthesia, interactive multimedia and virtual reality systems attempt to provide a false synesthesia that threatens the role of art and culture in achieving sensory balance.

MARSHALL MCLUHAN'S conception of synesthesia is central to his perception that electronic media recapitulate the aesthetic forms of non-literacy. Synesthesia, which derives from the Greek *syn,* for together, and *aisthêsis,* for perception, figures prominently in his exploration of how the mind coordinates the interplay of the senses. At times he depicts synesthesia as a cultural ideal—a state of nature from whose bosom alphabetic literacy tore us, and a possible future state to which electronic media might be capable of returning us. But one always has to be careful in dealing with McLuhan's attitudes towards such issues, particularly because of his expressed desire to be descriptive when dealing with social and cultural effects and to avoid what he considered moralizing. Hence it would be useful to examine what, exactly, McLuhan means by synesthesia, how his usage compares with other definitions of it in aesthetics and cognitive science, and how it relates to current developments in new forms of electronic communication, namely hypermedia, interactive multimedia, and virtual reality.

Such a course is prompted by a passage in Jay David Bolter's (1991) *Writing Space* claiming synesthesia as one of the effects of hypermedia. Such a notion prompts the question of what McLuhan would have made of it, had he had the chance to entertain it. Both Paul Levinson (1999, pp. 30–32) and I (2000) have observed that McLuhan often expressed himself in associationally linked reading units, or, to use the jargon, lexias characteristic of hypertext, and in so doing anticipated some part of its epistemology.

The question then arises, to what degree might he have seen hypermedia as a manifestation of the balanced interplay among all of the senses, his definition of synesthesia? The problems of definition will be dealt with later, but to get there we should first examine what Bolter says about synesthesia and how it relates to hypermedia and the range of claims made for it. I use the pronoun "it" here deliberately, in spite of the fact, not always observed among media analysts, that the word "media" is a plural. Here, I am referring not to a collection of media that might be in-

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voked with hyperlinks. Rather, I am referring to the system of interlinked communications itself, to hypermedia as a means of linking both textual and audio-visual files. This is the sense in which Bolter (1991) refers to it when he writes,

> Such multimedia texts are by no means the death of writing. A hypermedia display is still a text, a weaving together of elements treated symbolically. Hypermedia simply extends the principles of electronic writing into the domain of sound and image. The computer's control of structure promises to create a synaesthesia in which anything that can be seen or heard may contribute to the texture of the text. These synaesthetic texts will have the same qualities as electronic verbal texts. They too will be flexible, dynamic, and interactive; they too will blur the distinction between writer and reader. (p. 27)

This passage raises issues that certainly go beyond McLuhan's conception of synesthesia into the territory of the writerly text, as expressed in Roland Barthes's (1974) *S/Z,* but rather than pursuing that tack here, I wish to explore in more detail what Bolter means by "multimedia texts." Earlier in his chapter, Bolter gives his vision of the full range of electronic writing:

> True electronic writing is not limited to verbal text: the writeable elements may be words, images, sounds, or even actions that the computer is directed to perform. The writer could use his or her network to organize pictures on videodisk or music and voices on an audio playback device. Instead of moving from paragraph to paragraph in a verbal text, the reader might be shown videotaped scenes of a play in a variety of orders. The reader might move through an aural landscape created by various recorded sounds or walk through a city by viewing photographs of various buildings. (Such was the Aspen project. See Brand, 1987, pp. 141–142.) Any combination of these elements is possible. The same computer screen might display verbal text below or beside a video image; it might combine sound and verbal writing. These combinations have come to be called *hypermedia* and are already quite sophisticated. (p. 26)

But what distinguishes such "multimedia texts" from other forms of multimedia production, such as computer games, virtual reality simulations, television productions, documentaries, and other such mixed media? The distinction lies in the fact that hypermedia consists of a symbolic system that incorporates images into the textuality of the piece as a whole, rather than turning text into just another of a range of images:

> The introduction of video images might seem to turn electronic writing into mere television. Television itself often displays words on the screen, but it robs the displayed words of their cognitive value. Text on television is mere ornamentation; words appear most often to reinforce the spoken message or to decorate the packages of products being advertised. In fact, hypermedia is the revenge of text upon television (Joyce, 1988, p. 14). In television, text is absorbed into the video image, but in hypermedia the televised image becomes part of the text. (p. 26)

Still, we must ask why this must be the case. What makes text that accompanies sound and images in hypertext more essentially textual than that which might appear in, say, a public service announcement on television, which has just as much manifest content, not existing merely as decoration? Bolter does not address this issue here, but perhaps we can do so by contrasting the relatively high resolution and refresh rates of computer screens to those of television. The failure of Videotext in the 1980s, when the Internet was just beginning to spread out of research labs and into homes, and before the World Wide Web was created, might provide a clue. In McLuhan's terms (1964, pp. 22–32), such failure might be explained by the severe mismatch created by the attempt to marry a relatively hot, high-definition medium—text—with a relatively cool, low-definition medium—television. On television, one looks at text as graphics and completes its image in essentially the same way as any other graphic element on the screen.

To Bolter (1991) the most important difference lies in the fact that text, images, and sound used in hypermedia take on a functional role in determining the structure of the piece as a whole—potentially all of its "frames," and not just one at a time. That is, each textual and non-textual element in a hypermedia piece occupies a place in the logical structure of the piece analogous to the *topoi* of rhetoric (pp. 16–17), and thus becomes topical:

> Once video images and sound are taken into the computer in this fashion, they too become topical elements. Writers can fashion these elements into a structure. They can write with images, because they can direct one topical image to refer to another and join visual and verbal topics in the same network…. An art historian might take images of Renaissance painting and attach explanatory comments. In fact, one can link the comments not only to the whole painting, but also to given areas of the image. The eyes of one portrait may refer to a comment, which may in turn link to eyes of other portrait examples. Other parts of the painting would lead to other comments and other examples. The reader would begin with the first picture and then choose to read the network of examples and explanations in a variety of orders, based on an interest in hands, eyes, or other elements of Renaissance technique. In each case the elements of the pictures have themselves become signs that refer to verbal topics and to other pictures. The image is functioning symbolically within the writer's text. (p. 27)

McLuhan's Conception of Synesthesia

WHEN WE COMPARE this description of hypermedia to McLuhan's use of the term synesthesia we can see some significant differences. Initially, it is clear that McLuhan (1964) saw the connection between digital representations of reality and a heightened ability to involve all the senses, but in a way that returns modern consciousness to a preliterate mode of awareness:

> Nonliterate societies had small use for numbers, and today the nonliterate digital computer substitutes "yes" and "no" for numbers. The computer is strong on contours, weak on digits. In effect, then, the electric age brings number back into unity with visual and auditory experience, for good or ill.…

> The most primitive tribes of Australia and Africa, like the Eskimos of today, have not yet reached finger-counting, nor do they have numbers in series. Instead they have a binary system of independent numbers for *one* and *two*, with composite numbers up to *six*. …Tobias Dantzig, who investigated these matters, points out (in *Number: The Language of Science*) that the parity or kinesthetic sense of these people is stronger than their number sense. …The implosive (compressional) character of the electric technology plays the disk or film of Western man backward, into the heart of tribal darkness, or into what Joseph Conrad called "the Africa within." The instant character of electric information movement does not enlarge, but involves, the family of man in the cohesive state of village living.
>
> …By imposing unvisualizable relationships that are the result of instant speed, electric technology dethrones the visual sense and restores us to the dominion of synesthesia, and the close interinvolvement of the other senses. (pp. 110–111)

The differences between McLuhan's and Bolter's conceptions of synesthesia immediately leap out. First, neither in the passages previously quoted nor in the rest of *Writing Space* does Bolter make note of "[t]he implosive (compressional) character of…electric technology" nor of the role that "[t]he instant character of electric information movement" plays in reconfiguring "the family of man in the cohesive state of village living." Implicitly, his conception of hypertext is essentially static and spatialized, and his treatment of temporality seems to be confined to the contrast between static (text) and dynamic media (sound, film, and video), the latter of which force the user to wait until the clip ends before going on to explore other links. Thus, he makes no connection, as McLuhan does, between the virtually instantaneous nature of electronic communication and the generation of synesthetic effects. To Bolter, synesthesia is a strictly spatial phenomenon (as one would guess from his title) and exists purely as a set of visual relationships between media, no matter what their provenance.

The primary reason for this difference lies in the fact that Bolter and many proponents of hypertext and hypermedia derive their theoretical foundations from semiotics, the treatment of all linguistic phenomena as static signs, whether they be truly static, as in writing or print, or dynamic, as in speech. Thus they make no operational distinction between literacy and orality and assume that all words are essentially things, whereas McLuhan, Ong, and the other oralists recognize that words are of their very essence events, and that the origins of all languages lie in dynamic, evanescent speech. As Ong (1982) puts it,

> Thought is nested in speech, not in texts, all of which have their meanings through reference of the visible symbol to the world of sound. What the reader is seeing on this page are not real words but coded symbols whereby a properly informed human being can evoke in his or her consciousness real words, in actual or imagined sound. (p. 75)

Indeed, as I was transcribing this passage for quotation I was made even more aware of the fact that to do so I have always found it useful, and even necessary, to sound out the words as I transfer them from source to manuscript page or to screen if I am to remember them clearly enough to be accurate. This is precisely the same process that McLuhan (1962) noted occurring

in the medieval scriptorium (pp. 86–91), making note of the presence of such vocalization even in silent reading:

> Stressing the latent kinesthetic effects even in silent reading Chaytor refers to the fact that "some doctors forbid patients with severe throat affections to read, because silent reading provokes motions of the vocal organs, though the reader may not be conscious of them." He also considers (p. 6) the interplay that is between the auditory and the visual in reading:
>
> So also when we speak or write, ideas evoke acoustic combined with kinesthetic images, which are at once transformed into visual word images. The speaker or writer can now hardly conceive of language, except in printed or written form; the reflex actions by which the process of reading or writing is performed have become so 'instinctive' and are performed with such facile rapidity, that the change from the auditory to the visual is concealed from the reader or writer, and makes analysis of it a matter of great difficulty. It may be that acoustic and kinesthetic images are inseparable, and that 'image' as such is an abstraction made for purposes of analysis, but which is non-existent considered in itself and as pure. (p. 88)

Lacking such an awareness of the kinesthetic interplay between the oral and the visual in reading, semioticians thus lack either a physiological or an aesthetic theory that might underlie any conception they might have of synesthesia. Indeed, such a lack is likely one of the reasons that semioticians seem incapable either of understanding or appreciating McLuhan's work, as evidenced particularly in papers presented by such figures as Umberto Eco (1996), Geoffrey Nunberg (1996a), James J. O'Donnell (1996), and Paul Duguid (1996) at a conference held at the Center for Semiotic and Cognitive Studies at the University of San Marino, July 29–30, 1994, and collected under the title *The Future of the Book* (Nunberg, 1996b). Ong (1982) explains clearly how semioticians and their fellow-travelers the deconstructionists are exemplars of the graphomania that is one of the products of Gutenberg technology:

> Our complacency in thinking of words as signs is due to the tendency, perhaps incipient in oral cultures but clearly marked in chirographic cultures and far more marked in typographic and electronic cultures, to reduce all sensation and indeed all human experience to visual analogues. …But to try to construct a logic of writing without investigation in depth of the orality out of which writing emerged and in which writing is permanently and ineluctably grounded is to limit one's understanding, although it does produce at the same time effects that are brilliantly intriguing but also at times psychedelic, that is, due to sensory distortions. Freeing ourselves of chirographic and typographic bias in our understanding of language is probably more difficult than any of us can imagine, far more difficult, it would seem, than the 'deconstruction' of literature, for this 'deconstruction' remains a literary activity. (pp. 76–77)

The disdain for McLuhan among some contemporary semioticians is unfortunate and probably

misplaced, for he recognized the possibilities for synesthetic awareness in Structuralism, an outgrowth of semiotics and predecessor to deconstructionism:

> Before looking at the English evidence for the same concern with regularity and uniformity among printers, and print uses alike, it is well to remind ourselves of the rise of structural linguistics in our day. Structuralism in art and criticism stemmed, like non-Euclidean geometrics, from Russia. Structuralism as a term does not much convey its idea of inclusive synesthesia, an interplay of many levels and facets in a two-dimensional mosaic. But it is a mode of awareness in art language and literature which the West took great pains to eliminate by means of Gutenberg technology. It has returned in our time, for good or ill…. (1962, pp. 230–231)

That last phrase may give pause, but it is typical of McLuhan's determination not to take sides in describing the processes of media change.

Synesthesia in Aesthetics and Cognition

THE ROOTS of the return of synesthesia in our time can be traced back to Romantic aestheticism and Symbolism, in the writings of Charles Baudelaire, Arthur Rimbaud, E.T.A. Hoffmann, Théophile Gautier, Joris-Karl Huysmans, and others. Other plastic artists, composers, and writers, such as Wassily Kandinsky, Aleksandr Scriabin, Olivier Messiaen, Vladimir Nabokov, and David Hockney have claimed to be synesthetes and have evoked synesthetic effects in their work. Among them, though, only Nabokov and Hockney appear to have been true synesthetes, in terms understood by neuropsychologists (Dann, 1998). Responding to the reports of actual synesthetic experiences which began being published in the early to mid-nineteenth century, under the influence of Swedenborgian mysticism some of the Romantics and the Symbolists saw synesthesia as an artistic opportunity to escape the deadening effects of the Industrial Revolution and the growing spirit of positivism (Dann, 1998). As an early instance, Baudelaire (1857/1961), in his poem "*Correspondances*" ("Correspondences"), writes,

> …Perfumes, colors, and sounds respond to one another.
>
> There are perfumes fresh like the flesh of children,
> Sweet like oboes, green like fields of grass,
> —And others, corrupted, rich, and triumphal,
>
> Possessing the expansion of infinite things,
> Like amber, musk, benjamin and incense,
> That sing the transports of the spirit and the senses (p. 13; my translation)

In 1883, Rimbaud's (1883/1967) sonnet "*Voyelles*" ("Vowels") was published in a French literary magazine, with an appreciation by Paul Verlaine. It was clearly an attempt to put into poetic form the type of synesthetic experience in which letters of the alphabet take on both colors

and plastic shapes. It reads,

> *A* black, *E* white, *I* red, *U* green, *O* blue: vowels
> One day I will tell of your latent birth:
> *A*, black hairy corset of shining flies
> Which buzz around cruel stench,
>
> Gulfs of darkness; *E*, whiteness of vapors and tents,
> Lances of proud glaciers, white kings, quivering of flowers;
> *I*, purples, spit blood, laughter of beautiful lips
> In anger or penitent drunkenness;
>
> *U*, cycles, divine vibrations of green seas,
> Peace of pastures scattered with animals, peace of the wrinkles
> Which alchemy prints on heavy studious brows;
>
> *O*, supreme Clarion full of strange stridor,
> Silences crossed by words and angels:
> —*O*, the Omega, violet beams from His Eyes! (p. 121)

Here we see Rimbaud clearly evoking psychedelic effects, in a sense quite different from that which Ong has ascribed to the deconstructionists—none of whom, to my knowledge, has claimed possession of such powers.

In point of fact, synesthesia has been recognized for over a hundred and fifty years and studied as a neurological phenomenon, and recently much significant research has been published on it.[2] Note that I did not term it a neurological "condition," since it is considered a normal state for as many as one out of every 2,000 people (Lemley, 1999, p. 80). It has nothing to do with the lights and colors experienced by epileptics during seizures; in fact, synesthetes tend to feel that they have not just a different view of reality than the rest of us, but a better one:

> " To me, it's like you guys see the world in black and white," says Carol Steen, a New York City artist for whom letters, sounds, and pains evoke a variety of hues. "I've got it in color." Patricia Duffy, a language instructor at the United Nations, who senses color when she looks at letters or numbers or when she thinks of time units such as days or hours, emphatically agrees. "Synesthesia is wonderful," she says. "Losing it would be very upsetting, just like losing one of your senses." (Lemley, 1999, p. 82)

The cause of synesthesia has not been determined. One researcher, Simon Baron-Cohen, has speculated that all infants may even be born synesthetes, but that as the brain develops the normal process of "selective cell death" precludes synesthesia in most people. In his studies of infant brain development, Baron-Cohen has noted that in infants up to six months old, patterns of cortical responses to either loud noises or bright lights are very similar, whereas afterwards, parts of the brain begin to be segregated as to function, so that sound excites neurological activity in the

temporal lobe, while visual stimuli excite the occipital (Lemley, 1999, p. 87). A rival theory by Peter Grossenbacher asserts that the brain cortexes of synesthetes may have unusually strong "feed-backward" sensory pathways between regions that deal with initial response to individual senses and those that integrate multisensory activity, such as the ability to see a particular shape and then pick it out from dissimilar shapes with the eyes closed. Grossenbacher claims that his theory explains better than Baron-Cohen's the synesthetic effects experienced by people who have taken psychedelic drugs, which could not occur if neuronal pathways had been cut off in the process of normal brain development (Lemley, 1999, p. 87).

If one recent study has succeeded in sampling a typical range of synesthetic responses, a pattern of types of synesthesia emerges. According to researcher Sean Day, in this study its most common form was the elicitation of colors, either by numbers and letters, units of time, spoken sounds, general sounds, or music. In smaller percentages, colors could be evoked by pain, odors, personalities, taste, and temperature (Lemley, 1999, p. 86). Not only do numbers and letters have colors, but subjects who have used color-matching software have been able to designate the precise color for them of each in terms of hue angle, saturation, and brightness (Lemley, 1999, p. 86). In comparison with non-synesthete control subjects, synesthetes were 92% consistent in their associative responses after the passage of one year, while the controls were only 37% consistent after one week (Lemley, 1999, p. 84). Synesthesia also appears to run in families, and it does not appear to be heavily weighted towards people with artistic abilities or temperaments, to whom it is attributed only because they tend to talk and write more about their differences, while others may be inclined to repress them (Lemley, 1999, p. 84). Also, because of the influence of the Symbolists, there has arisen an artistic tradition of creating systems of correspondences between senses, particularly between sounds and colors, as in Aleksandr Scriabin's light organ, that have overshadowed the literature of neurological synesthesia (Dunn, 1998).

A notable aspect of such research is that in the West, at least, expressions of synesthesia seem to remain at the denotative level of language and so are not embedded in culture itself. Synesthetes remain at the fringes of Western culture and so must assert their synesthetic abilities either through testimony or particularized artistic constructs. By contrast, there are other cultures, notably non-Western, in which synesthesia seems to be more integral to the culture and is even expressed in the morphology of the language. According to the *Encyclopædia Britannica Online* (2000), in the Austroasiatic languages,

> Expressive language and wordplay are embodied in a special word class called "expressives." This is a basic class of words distinct from verbs, adjectives, and adverbs in that they cannot be subjected to logical negation. They describe noises, colors, light patterns, shapes, movements, sensations, emotions, and aesthetic feelings. Synesthesia is often observable in these words and serves as a guide for individual coinage of new words. The forms of the expressives are thus quite unstable, and the additional effect of wordplay can create subtle and endless structural variations.

Thus, synesthetic expressiveness is built into the very structure of the language itself, allowing communicators to create new forms as they speak, making the language a plastic medium that bends to the speaker's purpose. One might also infer that the culture expressed in and by such a

language would itself encourage synesthesia as not only *a* way but perhaps *the* way of perceiving reality, as contrasted with the West, where synesthetes have to convince their audiences of the reality they perceive and are studied as peculiarities. Research has also been done on synesthesia in the Tzutujil Mayan language (Kieffer, 1974) and Tsonga ritual (Johnston, 1977) in the presence of hallucinogenic drugs.

Such research supports McLuhan's (1962) observation that non-Western art and cultures are more amenable to synesthesia, in terms of the ability to represent multifaceted aspects of reality on a single plane, rather than creating the illusion of vanishing-point perspective as seen from a fixed point of view:

> As Heinrich Wolfflin stated the matter in 1915, in his revolutionary *Principles of Art History* (p. 62) "the effect is the thing that counts, not the sensuous facts." Wolfflin began working from the discoveries of the sculptor Adolf von Hildebrand, whose *Problem of Form in the Figurative Arts* had first clearly explained the disorder in ordinary human sense perception, and the role of art in clarifying this confusion. Hildebrand had shown how tactility was a kind of synesthesia or interplay among the senses, and as such, was the core of the richest art *effects.* For the low definition imagery of the tactile mode compels the viewer into an active participant role. When Africans watch movies as if they were low definition forms for active participation, we are amused by the incongruity. (p. 41)

To underscore, we must recognize that McLuhan (1962), like verified synesthetes, saw synesthesia as the normal mode of perception, and "normal" perspective as the oddity:

> The arbitrary selection of a single static position creates a pictorial space with vanishing point. This space can be filled in bit by bit, and is quite different from non-pictorial space in which each thing simply resonates or modulates its own space in visually two-dimensional form. …The illusion of the third dimension is discussed at length in E.H. Gombrich's *Art and Illusion.* Far from being a normal mode of human vision, three-dimensional perspective is a conventionally acquired mode of seeing, as much acquired as is the means of recognizing the letters of the alphabet, or of following chronological narrative. …[B]y 1709 Bishop Berkeley in his *New Theory of Vision* was denouncing the absurdity of Newtonian visual space as a mere abstract illusion severed from the sense of touch. The stripping of the senses and the interruption of their interplay in tactile synesthesia may well have been one of the effects of the Gutenberg technology. (pp. 16–17)

He then makes a direct connection between synesthesia and the Imagination of Blake and the Romantics:

> Imagination is that ratio among the perceptions and faculties which exists when they are not embedded or outered in material technologies. When so outered, each sense and faculty becomes a closed system. Prior to such outering there is entire interplay among experiences. This interplay or synesthesia is a kind of tactility such as Blake sought in the

bounding line of sculptural form and in engraving. (p. 265)

Synesthesia and Electronic Communication

TODAY, under the pressures created by the "all-at-onceness" of electronic technology, which prompts a retrieval of the tactility of oral modes of communication, we are recapitulating these modes in other forms. In reference to an early-1960s attempt in England to introduce a reformation of English script in a "more phonic character," McLuhan (1962) notes, "In our desire to restore some unity of interplay among our senses we grope towards ancient manuscript forms which must be read aloud to be read at all" (p. 47).

In *Hypertext 2.0: The Convergence of Contemporary Critical Theory and Technology*, George Landow (1997) notes, "Medieval manuscripts present some sort of hypertext combination of letter sizes, marginalia, illustrations, and visual embellishment, in the form of both calligraphy and pictorial additions" (p. 63). This is a promising tack, for it seems to recognize that electronic communication through the computer is reprising, with variations, some of the aspects of medieval manuscript production and consumption. It also suggests connections between the computer screen and the "light through" of stained glass windows and illuminated manuscripts, as distinguished from the "light on" the printed page (1962, pp. 105–109).

Landow goes on to write, "These observations about hypertext suggest that computers bring us much closer to a culture some of whose qualities have more in common with those of preliterate man than even Walter J. Ong has been willing to admit" (p. 82). But when he discusses what Ong says about the computer, he demonstrates the particular blindness to what is actually being asserted that seems typical of the semiotically oriented proponents of hypertext. He claims,

> Nonetheless, although Ong finds interesting parallels between a computer culture and a purely oral one, he mistakenly insists: "The sequential processing and spatializing of the word, initiated by writing and raised to a new order of intensity by print, is further intensified by the computer, which maximizes commitment of the word to space and to (electronic) local motion and optimizes analytic sequentiality by making it virtually instantaneous" (*Orality and Literacy,* 136). In fact, hypertext systems, which insert every text into a web of relations, produce a very different effect, for they allow nonsequential reading and thinking. (p. 82)

Landow's objection is not quite beside the point: It is worse than that. What he considers Ong's mistake actually points directly to the delusion shared by the theoreticians of hypertext: that because it is nonsequential it is therefore nonlinear, unlike the obsolescent book. But one must object that there is no such thing as a strictly nonlinear hypertext, for all links embedded in a conventional hypertext are chosen by the author; unless that occurs, no matter what a reader desires, he or she is always under the control of what the author considers to be a "desirable" link. No conventional hypertext allows the reader, to borrow Norman O. Brown's (1959) phrase, meant in a quite different context, to be "polymorphously perverse" (p. 308). Rather than breaking the bonds of linearity supposedly forced upon the reader in a codex book, hypertext actually imposes a relentless linearity of a type to which no book reader is bound.

A book is a quite serviceable random access system: One can instantaneously, and freely, access any part of the book one desires, without having one's choices sanctioned by the designs of a controlling supratechnology. Randomness here is meant not in the sense of arbitrariness, but the ability to go at will to any part of the work without having to scroll through parts in between, as in a compact disc or LP, as distinguished from an analog recording tape. As shown in the work of Ong (1982) and Elizabeth Eisenstein (1979), in particular, in the five-and-a-half centuries of book development, the movement has been towards providing the reader greater and greater means of randomness in accessing information, through such navigational aids as sequential pagination, tables of contents, chapters heads and subheads, and indexes—the very tokens of "linearity" the hypertext industry holds in abhorrence. In the history of the book, the sequentiality built into such tools has actually worked to empower the reader in accessing information nonsequentially. By contrast, many hypertexts, particularly fictional productions, have actually served to wrest control of the reading process from the will of the reader, substituting instead a pseudo-aleatoric scheme of links determined by an omniscient author, who supplants the omniscient narrator and leaves the reader in a kind of imaginative limbo.

What is more, Landow (1997) overlooks the analytical point that Ong (1982) is making, that the "secondary orality" of computers is a "more deliberate and self-conscious orality" (p. 136), based as it is upon a proliferation of printed texts for instruction in programming and coding, design of circuits, tutorials in operation, explanation for "dummies," and so forth. It seems significant that the proponents of hypertext have consistently chosen as their primary means of spreading the gospel not hypertexts, but books: The so-called death of the book and its replacement by hypertext has served only to create more and more books that only build off one another in a never-ending spiral of self-replication.

While Jay David Bolter (1990) has produced a StorySpace version of *Writing Space*, it exists, and could exist, only as an ancillary to the printed book, and one cannot imagine its being the primary publication, with the book in the handmaid's position (or even absent).[3] [Editor's note: In the second edition of *Writing Space*, Bolter (2001) has abandoned the StorySpace version of the book in favor of a Web site (www.lcc.gatech.edu/~bolter/writingspace/), which on May 23, 2003 was not found on the server.] Anything as conceptually challenging as hypertext demands an ordered and rational presentation of ideas that build upon one another, which every theorist of whom I am aware has been at pains to produce, but with one notable exception: Gregory Ulmer (1992), whose "Grammatology (in the Stacks) of Hypermedia: A Simulation" attempts its simulation in linear print form and thus loses the formal characteristics central to the technology—in McLuhan's terms (1964, pp. 7–21), the "message" of the medium. The eloquence expended on the new age of hypertext is possible only though the media of the book and journal article, supposedly anathema to the hypertext world. The prospect of writing a hypertext about hypertext and expecting it to possess the same explanatory power as a book or article about it, or any other subject, seems about as useful, to borrow a phrase used by Elvis Costello (White, 1983), among others, as "dancing about architecture" (Scott, 2000).

This is not to assert that hypertext lacks use or value. Quite the contrary: Hypertext is most valuable when it is used either to make connections that surpass what books alone cannot achieve, or to extend functions already inherent in books to enhance their usefulness as random access devices. And this random access function is fulfilled most completely when the work uses

the navigational aids built up over five hundred and fifty years of printing, rather than trying to subvert them. Thus, dictionaries, encyclopedias, user manuals, training systems, travel guides, atlases, and other reference works are naturals for hypermedia, since their functionality is thereby enhanced. Hypermedia also has been used creatively in such venues as interactive museum collections, travelers' kiosks, parallel presentations of literary texts and taped performances, and learning systems (Barrett & Redmond, 1995). But the more it seeks to subvert the uses to which books have been put over the past millennium and more, as in imaginative fiction, the more dubious it becomes in connecting with the needs and desires of the vast unhip and untrendy majority of humans. To be sure, what are termed free-form multimedia systems such as Anchors Aweigh (Brown & Chignell, 1995) and XML (eXtensible Markup Language) for the World Wide Web allow users to customize and define their own links within documents and document sets. Nevertheless, the results of such customization still fall short of synesthesia, since they do not transcend the linear bounds of dynamic linking and sequential processing.[4]

It appears that the missing element in the evangelists' awareness about the effects of hypertext is the very element that Bolter claims for it: its purported synesthesia. As we have seen in comparing other types of synesthesia—whether artistic, neurological, or both—with that claimed for hypermedia, the latter comes far short of matching the former. What seems primarily missing is the simultaneity present in true synesthesia: With hypermedia, one always has to wait for the animation to complete its cycle, or the audio or video clip to come to an end. In contrast, we need refer only to the foundations of Western culture in the oral performances of the great Greek epics, which Eric Havelock (1986) reminds us were not readings but true performances, involving the simultaneous interplay of many, if not all, of the senses:

> For its teaching, oral societies have to provide suitable performance context attended by audiences who will be invited or invite themselves to share in what is on the one hand a language of specialists, yet on the other a language in which all to a varying degree participate. The festival became the occasion of epic ritual and choric song and dance. …The oral audience participated not merely by listening passively and memorizing but by active participation in the language used. They clapped and danced and sang collectively, in response to the chanting of the singer. (pp. 77–78)

Another crucial missing element in hypermedia is tactility, which to McLuhan (1962) is the essence of synesthesia. Landow (1997) notes,

> Text-based computing provides us with electronic rather than physical texts, and this shift from ink to electronic code—what Jean Baudrillard calls the shift from the tactile to the digital (*Simulations*, 115)—produces an information technology that combines fixity and flexibility, order and accessibility—but at a cost. (p. 21)

That cost, Landow avers, is the lack of fixity in the text extended over what Bolter (1991) refers to as "the whole life of a text" (p. 31). But, to contradict once more, absolute fixity has never been characteristic of texts: What Bolter and others are remarking on is rather the relatively greater impermanence of electronic texts, which is due to the evanescence of the electronic image.

Manuscripts have always been notoriously subject to "scribal drift." Printed texts have always undergone a constant process of revision, whether it be for optimizing the accuracy and sufficiency of a manuscript for production, correcting errors in subsequent printings, reflecting reconsiderations or revisions by an author, or realizing an ideal representation of a supposed Ur-text. In print, that process has necessarily been slower, but electronic means of generating text have only speeded up the process of transformation, not created it. Indeed, the greater one's awareness of the impermanence of an electronic text, the more urgent one's desire to print it out to preserve it in a fixed form before it gets changed. The disappearance of editions in electronic text only serves to increase the pressure for fixed representations for future reference.

But the ultimate cost of hypermedia is not its lack of fixity but its divorce from somatic input and interplay—the very characteristics that make synesthesia valuable in cultural and aesthetic terms. Baudrillard's reference to the shift from the tactile to the digital gets to the heart of this problem, for it helps us to historicize once more the reconfiguration in the ratio of the senses that takes place during any shift in communications media, whether evolutionary or revolutionary. Throughout his work, in discussing the distinctions between "hot" and "cool" media, McLuhan (1964, pp. 22–32) was careful to note that these are only relative terms. They are useful not in fixing forever the immutable characteristics of individual media, but only in helping us to appreciate how and perhaps why the introduction of a new medium into an existing communications environment changes the ratio of the senses. Print is a hot medium only *in comparison* to manuscripts, just as television is a cool medium only in comparison to print, radio, and film. Thus, we would expect the introduction of hypermedia into the existing media multiverse to reconfigure relationships among exiting media, and to possess characteristics that we need not blithely assume to be the same as those of television, simply because they share the cathode ray tube technology. Certainly, Michael Joyce's (1988) dictum about hypermedia being the *revenge* of text on television alerts us to a possible agonistic relationship between them.

So it should not come as much of a surprise if we see hypermedia sharing the hotter, higher-definition, lower-involvement characteristics of text. This seems paradoxical, for the hypertext evangelists are constantly stressing how much the reader becomes involved in the creation, or recreation, of the work, how empowered the reader is, and how free the reader is to explore *ad libitum*. This seeming paradox is a problem only if we fail to make the distinction, as McLuhan does, between *activity* and *involvement* in the experience. Users of hypermedia may be very active in exploring the paths laid out for them in the web of lexias provided, but that is not the same thing as saying they are highly involved in representing what they are experiencing. Certainly, the higher-definition environment of the computer screen has something to do with this, but equally important is the fact that their participation is only superficial—every dynamic aspect of a hypertext is pre-programmed by the author, and users can follow only those links that have been given prior sanction.

What is more, within any particular frame, users are allowed to experience and process only one passage, image, video or sound clip at a time. Indeed, overlaying them over one another within the same experiential frame (both spatial and temporal) results in cognitive dissonance at best and chaos at worst. To be sure, one can open multiple windows and arrange them in a pseudo-collage, but under such conditions one window is always privileged, and the tiling created can do nothing to overcome the fact that we process text, images, and sounds sequentially, not

simultaneously. Bolter is correct in asserting that in incorporating all prior media, hypermedia relegates them all to the status of text. Where he errs is in asserting that the effect created can be called synesthesia, which we have seen requires a participatory element that hypertext ultimately lacks. This is not to deny that electronic media cannot attempt to mimic synesthesia, merely that hypermedia doesn't do it.

Are there any electronic media that do? In the last chapter of *Electric Language,* Eric McLuhan (1998) points to interactive multimedia (IM), such as video games, and virtual reality (VR) as attempts to substitute a "fake synesthesia" (p. 181) for the real thing. Here he extends his and his father's work by exploring the studies of synesthetes by Dr. Richard Cytowic (1993/1998) to establish the connection between synesthesia and the normal process of perception. Cytowic claims that synesthesia is based in the limbic system of the brain,

> which provides equilibration for the individual perceptual body as in their way do the canals of the inner ear for the individual physical body. In a parallel manner, the arts and human cultures serve to provide balance for the social body and the body as extended by technologies. (E. McLuhan, 1998, p. 178)

He finds components of the limbic system in every part of the nervous system, from the spinal cord to the cortex, thus constituting its "emotional core" (Cytowic, 1993/1998, p. 157). Thus, the extraordinary experiences of synesthetes point to a way of answering one of the central questions in media ecology:

> Examining these states of consciousness will show that synesthesia depends only on the left hemisphere, that a structure called the limbic system is essential for its expression, and most surprising of all, that it does not rely on the brain's *cortex.* (Cytowic, 1993/1998, p. 127)

Eric McLuhan (1998) writes,

> We are here on the trail of one of the great mysteries of human innovation and society, namely, how are technology and culture intertwined? It was thought that every human technology, as a prosthesis, disturbed the balance of the perceptions and thereby modified the patterns of society. In other words, each major technology meant a new mode of culture and identity, private and corporate. The arts immediately respond with their own synesthesia, to balance or to reveal the new disequilibrium. …
>
> If, as Dr. Cytowic maintains, synesthesia has its base in the limbic system, then IM is humanity's first attempt to extend the limbic system with a technological prosthesis. Our electric media individually and together serve as an external analogy to or prosthesis of the body's central nervous system. When we fling the central nervous system around the world we at once make the physical body obsolete and interiorize all human experience. (pp. 177–181)

Hence, in escaping this state so desired by many devotees of electronica, perhaps we are fortu-

nate that hypermedia falls short of creating the synesthesia it lays claim to. What interactive multimedia and virtual reality hold in store for us remains to be seen.

In summary, the concept of synesthesia held by at least some theorists of hypermedia falls well short of uses of the term in aesthetics, neuroscience, and media ecology, where it involves an instantaneous interplay or interaction among the senses. What they mean by synesthesia seems restricted to the idea that hypermedia makes it possible to call up files created in a variety of media within the same platform. The critical theory applied to hypermedia considers all symbolic units, whatever senses they may engage, as texts that are interreferential among themselves but have no symbolic relationships with the universe of orality. Such a reduction of semantic units to visual and spatial relationships is diametrically opposed to the polymorphous interplay of the senses that true synesthesia entails.

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Endnotes

[2] A keyword search for "synesthesia" on HOLLIS, the campus-wide Harvard online library catalog, on June 7, 2000 yielded 28 entries, and an online search for the same term on the Web of Science Citation Databases of the Institute for Scientific Information on June 10, 2000 yielded 51 articles published since 1983 in art, the sciences, and the humanities. For the most available recent books on the subject, see Baron-Cohen (1996), Cytowic (1989, 1993/1998), and Dann (1998). A comprehensive World Wide Web site that not only explores the literature on synesthesia but also simulates some of its effects can be found at http://web.mit.edu/synesthesia/www/synesthesia.html.

[3] Richard Lanham (1993) has also published *The Electronic Word* as an electronic book. While such productions have hypertextual elements, such as the ability to do keyword searches, record notes, bookmark pages, change typeface, mark passages, and copy quotes in a notebook, they are more like linear books with electronic versions of actions one can perform with a printed book. There are no pseudo-aleatoric links predetermined for the reader, and the text is essentially the same as in the printed versions, without division into lexias.

[4] I am indebted to John McDaid, William Bly, and Susan Jacobson for suggesting that I consider such qualifications to my argument.