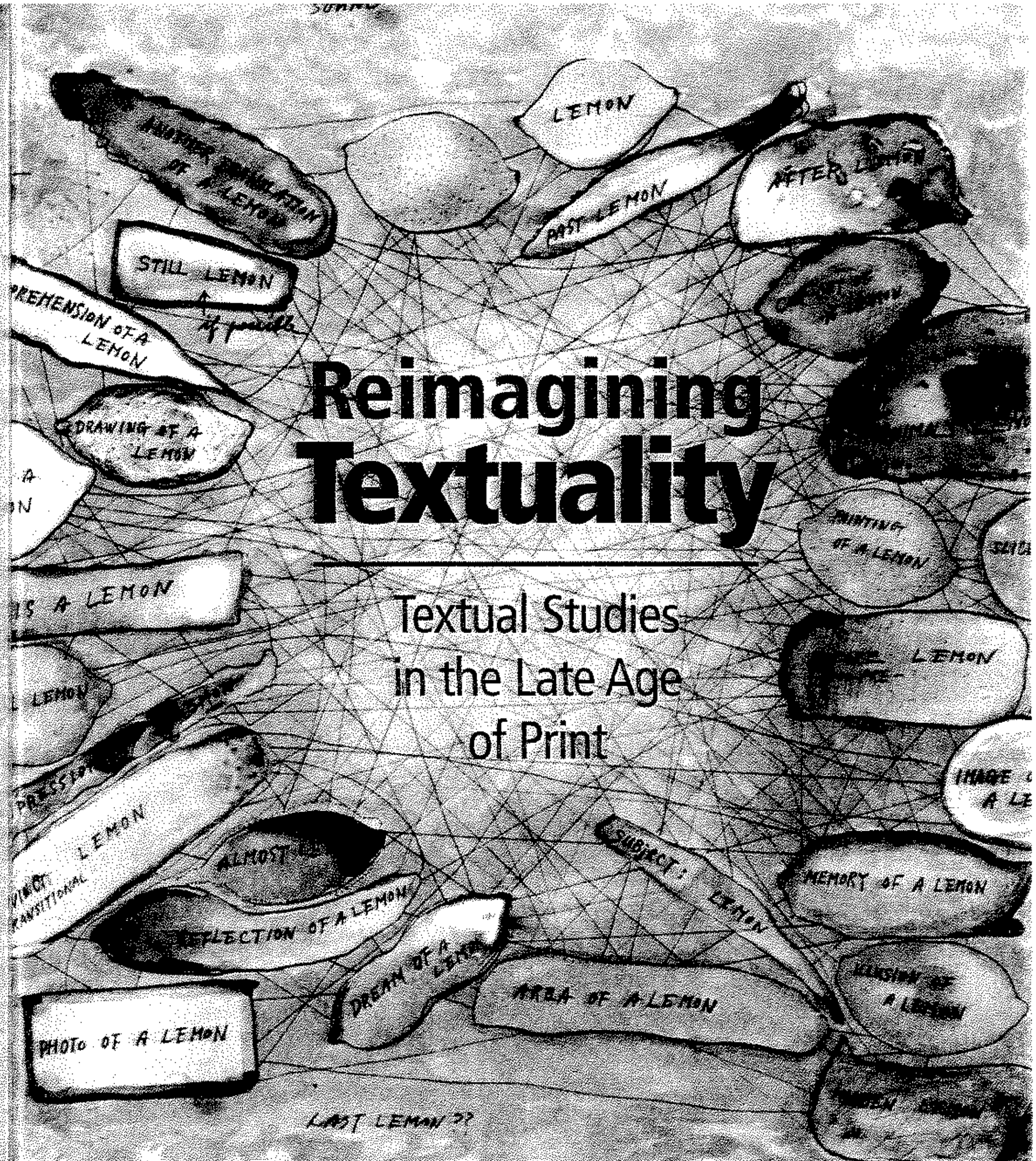

Reimagining Textuality

Textual Studies in the Late Age of Print

Edited by
Elizabeth Bergmann Loizeaux and Neil Fraistat

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Johanna Drucker

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In the electronic environment, new forms such as hypertext, hypercard stacks, and the rhizomatous, interconnecting threads that link one website to another in the vastly amorphous and seemingly unbounded field of the Internet have all generated critical speculation. The structure and form of the traditional, linear-seeming print media have been reinvestigated, resulting in the insight that many features of hypertext have precedents in conventional formats, while other features are significantly transformed by electronic technology. But are there even more fundamental issues about the nature of textuality that come into focus in the electronic environment? Textual studies have brought attention to the ways various aspects of materiality (type, format, paper, book structure) participate in the production of meaning, just as the "immaterial" text of the electronic environment has become a fixture within the popular imagination. To understand what portion of the actual message and meaning a text communicates is challenged, intensified, or lost in this electronic environment, we must ask the basic question, "What constitutes the information of a text?" In particular, does the structure or configuration of a text (its schematic organization), an increasingly self-conscious feature of electronic texts and website "interfaces," actually function as information at the level of textual production?

To answer these questions, it is useful to start at the most basic level—that of the letter—since it is at this level that the first link between electronic

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storage and textual information is made. Considering what the identity of a letter contributes to a text—as a visual form, a graphical form, and an element of a finite sign system—leads quickly to philosophical speculation about the basic relation between form and information in letters themselves. Does the letter *have* a body? Or, does the letter *need* a body?[1] The assumptions underlying these two questions are quite distinct. If we assume that a letter *has* a body, then its identity is bound up in some *essential* way with that form. If the letter merely *needs* a body, then the implication is that the letter could function simply by having any form that is sufficiently distinguishable for it to be recognized and read. The first identity can be characterized as phenomenological: it assumes an inherent essence to any form (graphical, visual, metaphysical), and further, that such an essence constitutes substantive information which would be irrevocably lost if the letter's form were altered past all recognition (as in fact occurs when a letter is stored electronically). The second concept of identity is more clearly semiotic: it assumes that identity relies on systematicity and difference, so that the letter has to be a distinct element in a system of signs. In an electronic situation, this means that its encoded form (binary sequence) is distinct from that of any other letter; the letter is considered functional rather than visual, and any notion of essence or substance is discounted. The question of whether graphic form is substantive *information* replays in the electronic environment at every level of textual production: What is lost in the encoding of the discrete elements of written language (the transformation of letters into binary code and/or algorithms)? To what extent can the "material" information in document formats be translated into such binary storage? And does the format design of graphical interfaces for the display of information in every area of communication (including poetic expression) actually contribute substantively to the text? Philosophical questions, linguistic histories, technical issues, and design concerns can all be brought to bear on the question of which graphical and visual features are to be considered textual "information" in an electronic environment.

Electronic media push the examination of form to the very limit of its existence as binary code. At a philosophical level, the question is whether information stored as code has been pared down to its inherent, essential identity as data, or whether, on the contrary, code is always, and merely, an inscription of difference that produces meaning in a system. (Since "difference" by definition cannot be substantive, one could suggest that binary code, the fundamental condition of all electronic information storage, can never constitute an essence, a substance, or inherent form.) Many questions arise from this fundamental consideration of the "ontology" of the text in "code storage," and from consideration of the way graphical features of a preexisting print text are affected by the process of encoding into electronic format for storage. These considerations open a rift in relations between form and meaning, between a letter and its graphical identity, between a text and its configured format—relations that seem inextricably intertwined in print media. In the electronic environment, these distinctions are newly conceivable because it is possible to imagine (and encounter) a letter or a text outside or independent of any specific embodied form—not as an abstraction, but as a daily reality.[2] For instance, there is no longer any necessity that a text be inscribed within a material substrate: a document can be stored in an electronic form and then output through a variety of devices to produce musical notes, graphical forms, patterns of lights in a theatrical stage, or letters on a page. There is no *necessary relation* between the material form of input and the material form of output in electronic media. The mutable condition of "code storage" can transform the identity of the written text. This introduces a new self-consciousness about writing's past functions, dependencies, and relations to materiality. Code scintillates between material and immaterial conditions long enough to let us ask what (and how) the substantive content of material might mean, and what an *immaterial* text might be.

This essay traces these issues through different levels of investigation, beginning with the question of the letter posed above and its fundamental identity in the electronic environment. In philosophical terms, this question is posed as an investigation of the "ideality" of form (or form as cognitive sense, an idea, or an idea that appears to consciousness as a form but without materiality). In the electronic environment, this "ideality" becomes problematic when considered with respect to the identity of the letter and other visual features of a text, because the basic investigation of whether a letter *has* or *needs* a body already questions whether a letter's identity may be bound up in its material form or whether it exists without materiality. If form is determined in part by the transformation that takes place between a stored file and an output device (if a keystroke of input becomes a musical note as output), then to what extent is the "information" of that output actually a substantive part of the text? I will investigate this question here by looking at the graphical organization of various documents—print media to electronic, with a special focus on poetic works and their use of the spatial and temporal potential unique to the electronic domain. If graphical format (at any level from letter to document) *is* an integral part of textual information, then how does the stored condition and mutability of that information in the immaterial environment transform, alter, or threaten the substantive content of an electronic text?

The curious history of language in its relation to electronic media enters into critical consideration here. That history involves a basic split between the logical language used to interface human communication with machine function and the analysis/interpretation of "natural," data-rich language by

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the machine. In each case, the concept of what constitutes "information" is subject to different constraints and limitations or meets different kinds of problems in machine processing. The development of logical languages progressed as programming languages proliferated after the mid-twentieth century, spawning a veritable Babel of dialects for specialized purposes. But such "languages" are more mathematical than linguistic: highly constrained and specific, basically aiming to eliminate ambiguity, nuance, or variable interpretation. Meanwhile, natural language reached certain impasses in its relation to computers: early (1960s) optimism about the capacity to parse natural grammar into machine-readable and machine-usable forms foundered on the problem of the context-dependent character of linguistic meaning.[3] The two trajectories by which language and machine interact remain fundamentally at odds, splitting along the line that divides two belief systems (top-down programming or bottom-up data processing) on which rival concepts of artificial intelligence came to be based.[4] Current debates about whether *either* a logical *or* a data-rich system of representation adequately mirrors *thought* (basic cognitive processes) continue to test their positions in and through functions of language(s).[5] But this leaves open the question of how aesthetics and form function as components of meaning. Therefore, I suggest that in addition to logical and natural language, we consider *configured* language (that is, language in documents where format, graphical organization, or other structural relations contribute substantively to textuality) in the electronic context. The properties of configured language are not the same as either an algorithmically programmable statement with its logical, mathematical premises, or the replete, complex, context-dependent, mutable utterances of natural language familiar from daily usage. Configured meaning is an aesthetic, structural, and substantive part of linguistic form. Consideration of configured meaning (in which configuration is taken to be part of textual information) allows us to revive the philosophical inquiry into the relation between sense and form. This can be explored initially in the interrogation of the identity of the letter, and then at the level of text, document, and archive. The exploration always asks how the visual forms of language inform the production of meaning in the electronic environment, and, in turn, how the apparently "immaterial" text of the electronic domain offers the possibility to interrogate the fundamentals of "ideality" of sense in relation to visual, graphical form through an examination of configured meaning at the level of the text.[6]

The Identity of Letters as Forms

The process by which any text can become stripped of its materiality as it enters the electronic environment is readily illustrated. Imagine the dilemma of the archivist or librarian deciding on the appropriate mode for storage of a handwritten work or a printed document that has as much visual information as it has textual information.[7] The document can be saved as a text file, such as an ASCII file, in which the sequence of strokes on a keyboard will be all that is left of the visual information of the original document as it becomes a bare record of linguistic fact. The other choice is to save the document as an image, a picture of the document itself—at much greater cost, with much greater memory requirement, and without benefit of access through text-based search engines. The question of what is lost (and gained) in the process of turning a text into the stripped-down, letter-by-letter-only form of an ASCII file immediately calls attention to the rich materiality of visual information that is an aspect of *any* text file. This is now familiar territory in the work of bibliographers, literary critics, and poets who pay attention to "materiality" in the production of textual meaning.[8]

For a specific example, one has only to think of turning the Pythagorean "Y" and its emblematic visual symbolism into the keyboard stroke for the letter to realize how much "meaning" is lost in the translation. In the version designed by the Renaissance typographer and printer Geofroy Tory, this "Y" (fig. 1) contains considerable "extra" visual information to make its metaphoric moral point about the choice between the difficult path of virtue and the easy path of vice. In such an extreme case, the loss of "information" is not purely textual, but the spectrum that stretches from this example through the full gamut of illuminated and engraved letters to display faces, fancy script fonts, and utilitarian-seeming (but nonetheless historically specific) type designs is a continuous one. The question of the point at which such "visual" information is fully contained within the "textual" is moot if one realizes that any transformation of the material form of a written document alters and often diminishes the actual information in a piece. The crucial question is which aspects of information are lost in the encoding—and whether they merely need a higher level of code or programming in order to be recorded, or whether the very process of transformation from material to immaterial condition is an intervention in the ontological identity of a text.

To frame the argument, I want to return to the questions of the letter and its relation to a "body" or a form through the concerns faced by practitioners in trying to understand what a letter *is* so that it can be translated into electronic form. In the late 1970s and early 1980s, the mathematician Donald Knuth attempted to make a program for the alphabet.[9] This immediately brought him up against the heart of the problem: Is there an algorithm specific to each letter of the alphabet such that any and every instance of that letter conforms to and is describable by that algorithm?[10] Or are letters merely elements of a set which only have to be distinguishable from one another? In the first case, the assumption is that the form of a letter is part of

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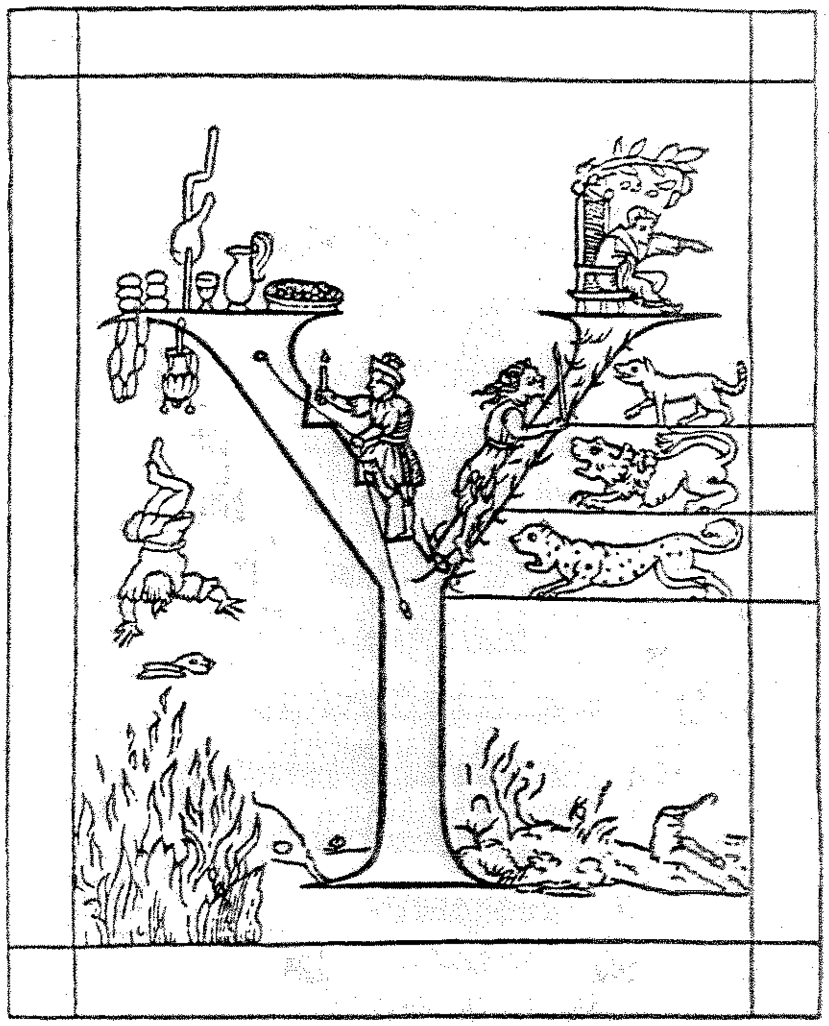

Figure 1. Geofroy Tory, Pythagorean "Y," in *Champ Fleury* (1529, Paris).

its identity (as noted above, it *has* a body). In the second, the assumption is that a letter may take any form as long as it can be recognized within a finite set of other symbols (it *needs* a body to distinguish it from the twenty-five or fifty-one other letters, plus numerals and signs of punctuation). The either/or nature of this distinction—the idea of a letter's essence being describable as a mathematical formula which always and only results in a form of that letter or, by contrast, the idea of a letter as a mere place-holder whose form is utterly without significance—gets blurred in the nuancing of the nature of the set that is comprised by all letters. This is, as Douglas Hofstadter describes it, not a fixed, closed set but an open set, one in which every and any instance of occurrence adds to the set without distorting its defining parameters.[11] (He compares the letters to chairs as a set: they are not describable in a single, highly constrained, and specific mathematical formula, but nonetheless, they are distinguishable from other items of furniture by definite characteristics, and every instance of new chair-ness simply expands the set to include new members.) This elasticity confounds the reductive requirement of the algorithmic identity. To a common-sense perception, letters *seem* to have an essential form that would lend itself to an algorithmic description. But in actuality, the means by which we regularly read/process their forms are system-dependent, relying on convention, and not inherent.

Knuth's dilemma becomes even clearer when the problems of generating letterforms are contrasted with those of recognizing letterforms. Programs for optical character recognition (OCR) have to assess the symbol set, either according to primary characteristics (the basic-what-to-look-for of a crossbar, number of loops, ascender/descender characteristics used in sorting any set of symbols by distinctive visual features) or by making a match between the number of elements (whatever they are) and the number of letters/symbols in the notational system. By probability, distribution, and other statistical phenomena, the program attempts a one-to-one match and translation.

The practical dilemmas faced by designers (and technicians) in the display of letterforms within the electronic environment also touch on these issues. If a letter were in fact fundamentally algorithmic, its shape and distinctive graphical features could be prescribed as variations on a single formula. In scalable, multi-sized fonts, letters *are* described as objects. That is, they are stored as a set of instructions about shape, form, openings, and closings—as complex images whose patterns of line are recorded in mathematical descriptions as curves, straight lines, or connections among points on a bezier curve or a grid. This "object" can be treated in many ways—sloped, thickened, stretched—without losing the fineness of resolution essential to communicating its form. But fundamental, geometric form is not reducible to an *essential, prescriptive* algorithm, though it can be stored as one that is *nonessential* and *descriptive.* The latter algorithm does not constitute the *identity* of the letter, but it creates an adequate description of a designer's drawn pathways, vectors, and shapes as visual information.[12]

Letterforms can also be described and displayed as patterns of pixels, or screen lines, and then output as points in a grid or as the start/stop of raster

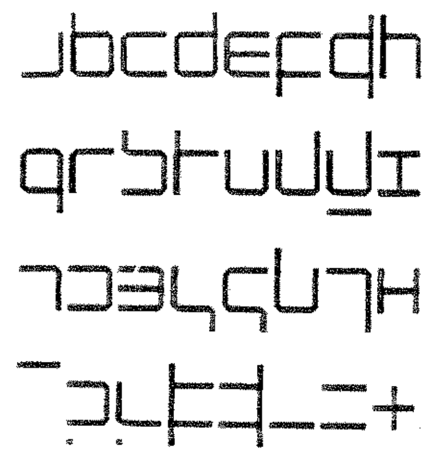

Figure 2. Wim Crouwel's "New Alphabet" (19

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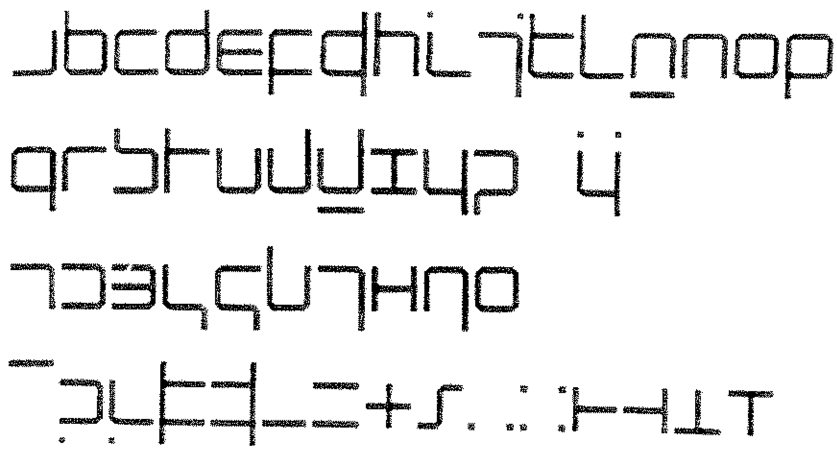

Figure 2. Wim Crouwel's "New Alphabet" (1967, Utrecht). (Courtesy of Crouwel)

lines. Display modes (whether on-screen or as output) that use this approach merely map a shape (the metaphor is of a hooked rug or needlework tapestry in which the fineness of resolution depends on the fineness of the screen or scrim pattern). No information about the way the image is arrived at is stored—merely the shape it makes. The letter is not an "object"; it is only a footprint in the grid.[13] In this approach, no attempt has been made to construe the "identity" of the letter; there is no "inherent" form, merely a drawn pattern.

The technical requirements of screen displays (and early, low-resolution output devices) are such that the question arose of the *essence* of each letter as a shape. In a font like the machine-friendly "New Alphabet" designed by Wim Crouwel in 1967, the identity of the letters resides as much in their distinction from one another as in their continuity of letterform traditions. (One has only to isolate one or two of the characters from the others to realize the extent to which recognition depends on the set; see fig. 2.) The issue of *essence* comes to the fore when low-resolution or reductive display mechanisms require compromises in the conventional forms of letters. The question of whether the *A*-ness of the *A* resides in its capacity to be differentiated from the *B* or in some inherent property recognizable in a crude pattern of "jaggy" pixels is cast as a very practical one.

As letterforms have evolved and proliferated in the era of electronic type design, liberties with conventions have been taken to new extremes. Freed from the requirement of arduous, tedious, and expensive cutting of steel punches, type can be designed on the screen to function in the electronic environment or to be output photographically. The chimerical search for an inherent form of the letter proved elusive, a holy grail of a pseudo-mystical belief in essences, a sometimes too persistent remnant of the kabbalistic tendency to ascribe cosmic, universal values to the alphabetic code. But in a sense, this realization only revives the question of materiality with a vengeance: it is in the inscription of letters into forms, shapes, in accord with the whims and styles of a historical and cultural moment, that allows them to realize what might be termed the *affective massage coefficient of form.* That is the property whereby the graphical and visual properties inflect the text with a meaning that is not separate from its linguistic content, nor exactly proper to it, but interpenetrated with the text itself as its fundamental expression (thus the "massage" of meaning, a bending, flexing, of its "message").

Configured Texts: Historical Precedents and Electronic Possibilities

At the secondary and tertiary levels of organization (above the letter, at the level of text and the document), language contains information as format, using spatial arrangements as a way of constituting meaning. A familiar example is the outline form, in which headings, subheads, and sub-subheads demarcate a discourse into conceptual spaces and territories. Elaborately structured descriptive systems of cosmological breadth and ambition developed graphical form in the Middle Ages and blossomed in the Renaissance work of such ambitious polymath scholars as Athanasius Kircher and Bishop John Wilkins. Wilkins's monumental *Essay towards a Real Character and Philosophical Language* (1668) includes a full outline of all aspects of the universe—part of his scheme to represent all of knowledge/the world (in his work, collapsed without argument) in a corresponding system of notation. Throughout Kircher's many volumes, his hierarchical diagrams chart the structure of a full cosmology in graphic form (fig. 3). This may sound quaint and recall ideas that stretch back into antiquity and link language and knowledge in a guaranteed system (whether according to an atomistic logic or adamic naming), but those elaborately "configured" visualizations of the order of things, of knowledge, and of calculable relations possess a sense of the potential for communicating complex hierarchies of information through graphic form. At the moment at which Kircher (at the end of his long career) and Wilkins (at the start) overlap—the 1660s—the late medieval tendency to diagrammatic exhaustive detail combined with a

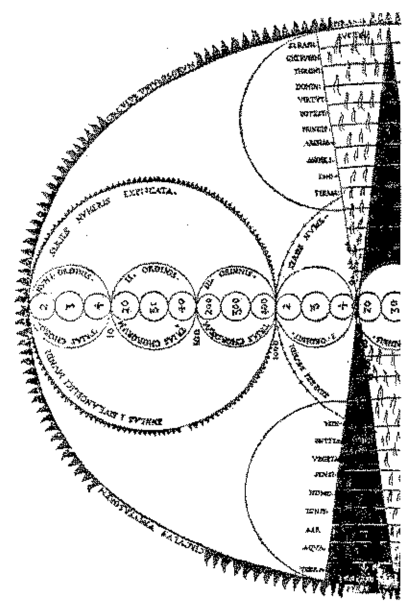

Figure 3. Athanasius Kircher, the three worlds,
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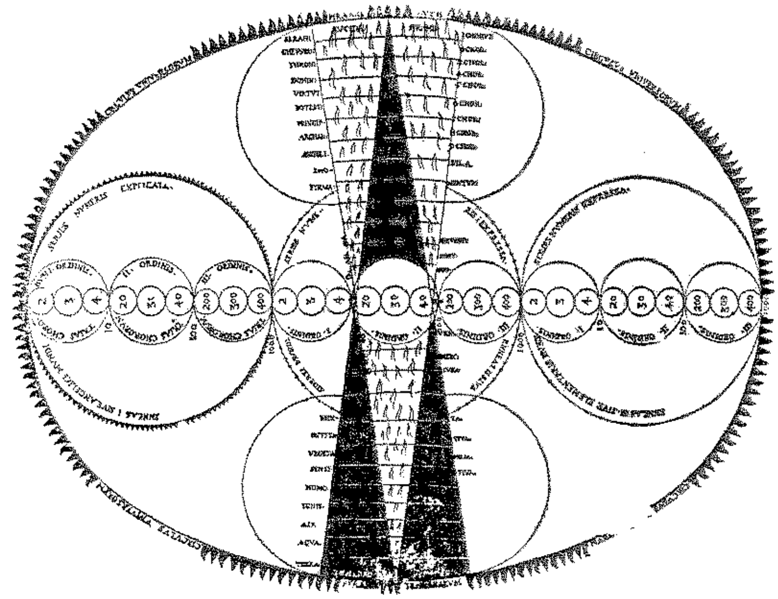

Figure 3. Athanasius Kircher, the three worlds, from *Musurgia Universalis* (angelic, sidereal, and elemental worlds in a hierarchy from top to bottom) (1650, Rome).

modern schematic system of categorization. The visual domain, particularly the graphical domain of print production, permitted elaborate pictorial realizations of knowledge as system in which format was clearly articulated as the substance, not merely the display, of information.

This relational, structural, aspect of materiality uses spatial relations as *significant,* as part of meaning. The old memory theaters, also devised in antiquity and perfected in conceptual and practical terms in the Renaissance, serve as another instance of intertwining meaning and spatialized relations. Such theaters used mental images of specific architectural spaces as a mnemonic structure, enabling elaborate recall of objects or information "placed" in them. In these systems, "space" is meant as something schematic, metaphoric, and abstract simultaneously. Relations among linguistic components can be mapped in a variety of ways which build on the conventions of spatialized organization: hierarchically in an outline, in tree diagrams, in grids, in various indexed charts, in two-dimensional graphs, or according to an iconographic or pictorial form (as in the case of certain concrete poems using shape to contribute to meaning), and spatially according to the descriptive coordinates of solid geometry (with a fourth dimension in electronic media). When these concepts of schematicization and spatialization intersect with electronic media, they can expand into the multidimensional structures available in hypertext and Internet architecture. The challenge is to make spatial organization clear enough—logically, conceptually, metaphorically, and visually—for it to be useful rather than confusing. Positing the value of this graphical quality forces the issue of the information of configured texts.

As a text is put into binary code storage or made into an element of a software program, should its typeface, style, and format be encoded as well? This question was answered in the negative by the original designers of HTML (hypertext markup language), the design software used to give graphical expression to texts, images, and websites. In effect, the decision that was made was that typography was *not information* in any *fundamental* sense. This decision was made for practical reasons: if, hypothetically, a text had to be capable of being displayed on any platform, system, or monitor, and if the HTML file had to be readable by any browser, then including the specific information of a typeface would restrict readability (the machine/browser/platform might not have that typeface) or would make the files too large to transport efficiently (they would have to contain the typeface, raising problems of copyright and sales control as well as file size). Recent moves to rethink this decision by modifying the capability of HTML (through development of DHTML, or Dynamic-HTML) and by including what are known as "cascading style sheets" (style sheets encoding typographic and format preferences for a file that are made available when the browser has the capability) have begun to redress this oversight. But the advantage of the "oversight" was to call attention to the dramatic significance that attaches to the material information included in type and format decisions in a document—whether designed in the electronic environment or merely stored there.

Whether any or all objects of thought can be reduced to a mathematical "configuration" as their ultimate and essential form is open to debate and speculation in mystical to mechanical modes. But it seems inarguable that configuration factors into the effective production of substantive linguistic meaning in electronic documents, as in print documents. The specific character of those factors is different in electronic media than in print media because of the presence of the additional factors of temporal, spatial, and linked manipulations. The dynamic capacity of display modes and the mutable nature of all files and browsers suggest a continual reconfiguration of most files in their reading and display, rather than a final, fixed, and static format. In either case—static/fixed or dynamic/mutable—configured information is meaning and contributes substantively to the "message" of the text.

Certain print conventions are readily adapted to electronic formats—for example, the now familiar form of the "front page" of a website or on-line

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document follows print conventions. The graphical form is essentially flat; the reading space is framed by the monitor as a "page"; and the links within a document are opened by clicking highlighted text. But once one moves beyond this graphical convention into spatialized modes of display, or confronts the difficulty involved in giving a visual gestalt to the interrelated documents of a complex archive, the electronic environment reveals its limits and potential simultaneously. Obviously, the absence of conventions not yet established is a limitation to "navigation"; the problem of "mapping" a course through linked archives (within a site/document/set of files or to outside sites) has yet to be given graphical form or consideration. Within a site—even within a document—there is the possibility of drawing on visual conventions such as mapping, perspectival schematically rendered space (in VRML or other spatial design programs), or drawing on a visual schematic that gives a graphical form to the hierarchical compartmentalization and interrelations of elements. The challenge of designing information interfaces that are at once intuitive, conventional, and adaptable to the dynamic activity of electronic materials tends to push designers either toward "cute" conventions—windows, doorways, desk drawers—or toward minimal but functional solutions (the "button" and highlighted text). The exploration of the configured text is in its infancy in this regard, though the interrelation between information architecture and user interface will become increasingly sophisticated as capacities evolve for representing conceptualizations within these structural modes.

The notion of configured text has been explored in a preliminary manner in the work of a number of poets for whom the electronic medium offers new possibilities of using a configured format. Works by Loss Pequeño Glazier and Jim Rosenberg give a concrete sense of this potential, while Charles Bernstein's work *Veil* illumines the translation between print and electronic media in an exploration of the distinctive properties of each.[14]

Both Glazier and Rosenberg make use of the screen as a "flat" space of display. In this regard, both observe certain print media conventions: the plane of reading is more or less perpendicular to the line of sight, and the type lies on that plane without dimensional distortion. Both, however, make use of the dynamic properties of the electronic medium. Glazier's work has a self-regulated rate of display. "Command: Change Folder" (1996), for instance, is a poem self-referentially concerned with the electronic document (fig. 4). As it loads on the screen, it scrolls down. The timing of the screen's rewriting and the timing of the poem's display are the same. Once into the second "verse" or section of the work, a screen appears in which there is an alternating sequence of words and phrases. These are dispersed in constellationary format, so that the words which appear in alternating intervals fill in the blank spaces, transforming the text in an on/off

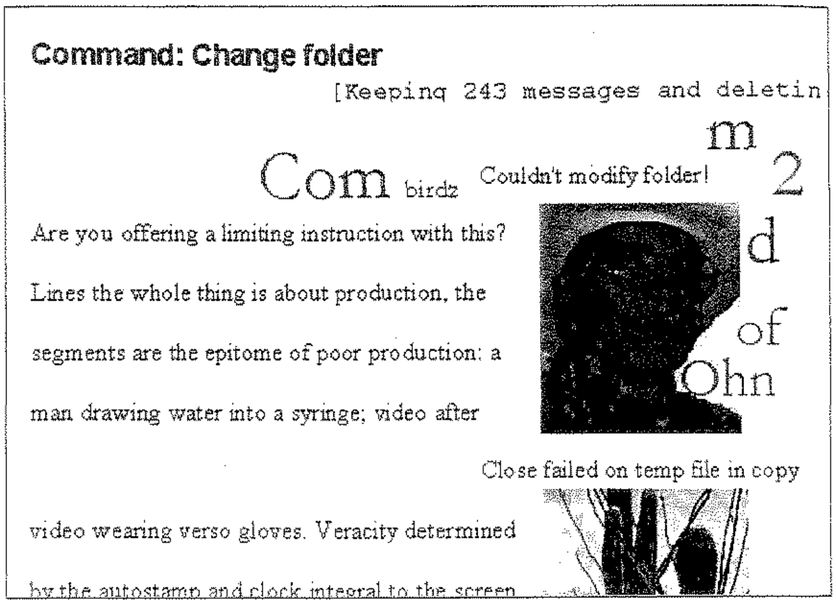

Figure 4. Loss Pequeño Glazier, "Command: Change Folder" (1996, Buffalo, N.Y.), a static image of a dynamic configuration. (Courtesy of Glazier)

binarism of linguistic production which takes full advantage of electronic dynamics and textual conventions. The text is configured spatially as well as temporally, and the material properties of a static text are either extended or subverted (depending on one's point of view) by this activity. Into the open holes of one text appears another which transforms the whole in a blinking alternation. It is the "immaterial" unfixedness of the text that allows its full configuration to be dispersed over a temporal axis. There is no single static state in the phenomenological perception of the work, though the ontological condition of the programmed GIF (graphical interchange format) files is also stable. Configuration is structured within the text display through a temporal articulation uniquely suited to work in the electronic environment.

Jim Rosenberg's work layers texts in hypercard stacks, one of the basic building blocks of nonlinear text models in electronic documents. The apparent layering, which makes the texts cancel one another in a dense palimpsest, can be undone, pulled apart, by the reader/viewer. Each successive layer of "Intergrams" (1993) can be selected independently, or it can be displayed in a mode of replete simultaneity (fig. 5).[15] Rosenberg's schematic diagrams of relations among text elements are key to his work. The

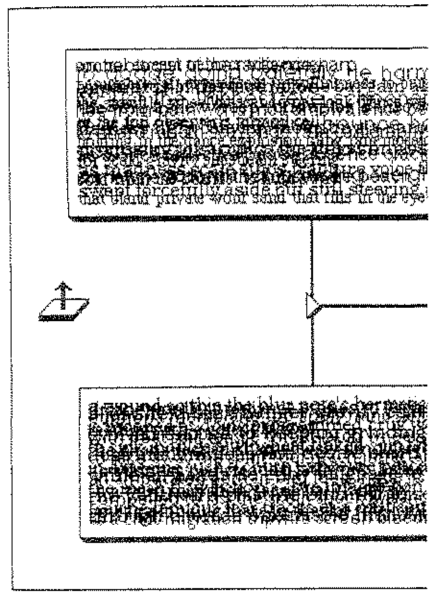

Figure 5. Jim Rosenberg, from "Intergrams" (1
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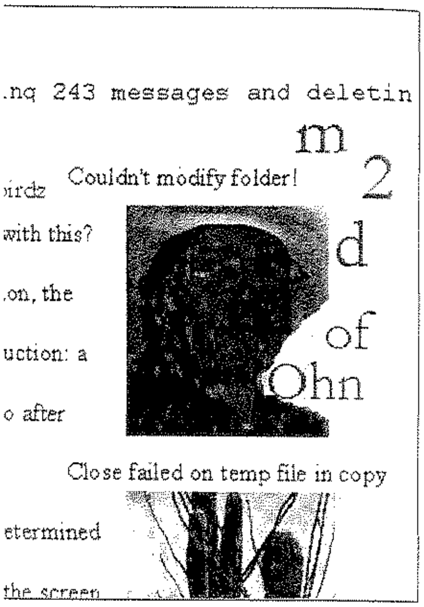

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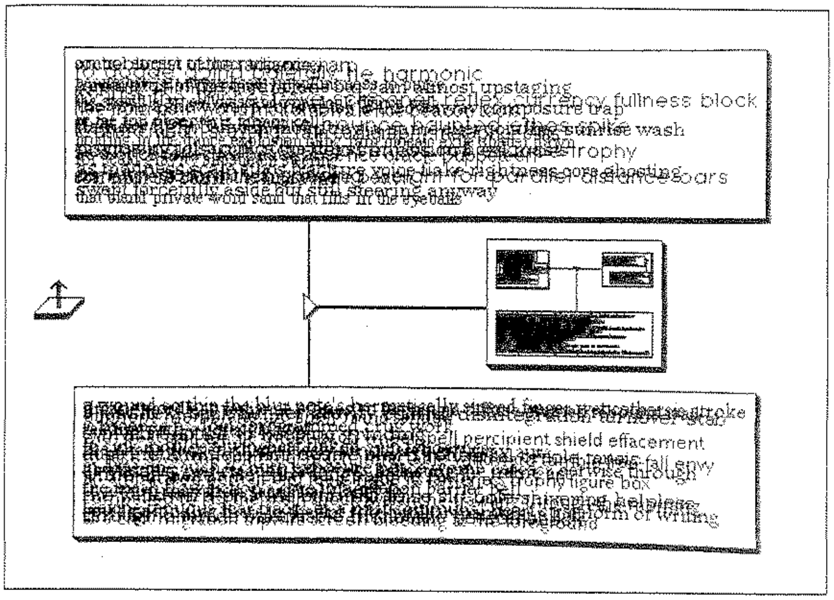

Figure 5. Jim Rosenberg, from "Intergrams" (1993, Watertown, Mass.). (Courtesy of Rosenberg)

visual configuration of the text *is* the text; its graphical organization and layout parse its conceptual and linguistic structure. One could debate the effectiveness of this structuring, but the usefulness of such a process in the interlocking of elaborate archives or documents would function informatively in the same way as flow charts, engineering diagrams, or other specific schemata for structuring relations among elements of a system. Although such infrastructure is evidently substantive, it is not, strictly speaking, linguistic. The relations *among* linguistic elements, however, do determine sense to a very real degree. Just as sequence determines meaning in English sentences ("Jane bit the dog." vs. "The dog bit Jane."), an expansion to other dimensions of relational possibilities factors into linguistic meaning production in ways that are not necessarily fully capable of being translated. Still, reading a table, a chart, or a graph requires that *position* and *sequence* be granted their full force of signification. Rosenberg's poetic works point toward the creative exploration of these dimensions of configured text, pushing structure to the foreground with insistence on its semantic contribution.

Charles Bernstein's two versions of his work *Veil,* produced in 1976, first published in print form in 1987 (Xexoxial Editions), and in electronic format in 1996, offer a useful contrast between two modes of materiality.[16] The printed *Veil* is a typewriter poem, produced on an IBM Selectric, in which overprinting line after line creates a scrim or screen effect of language which renders the text almost illegible (fig. 6). Like Rosenberg's "Intergrams" in their simultaneous mode of display, *Veil* is nearly illegible in print form. But this illegibility is the point of the text: its porosity permits scraps of meaning to surface through the dense field of letters, the fine mesh of its own self-produced screen *veil*ing the linguistic transparency of language with the effects of a layered text. The materiality of print form is inherent in the visual and verbal value of the work; they interpenetrate in a dialogic synthesis, the two aspects of the *writing*—visual and verbal—playing equal parts in the production of the whole.

In transposing *Veil* into an electronic format, Bernstein modified the text and the visual production (fig. 7). The layered effects on the screen take advantage of the possibility for bleed-through rather than cancellation. Where the letters in the printed *Veil* are always fully and entirely present, each layering upon the next in an irrefutable maximization of information, the letters and blocks of texts in the electronic version merge. For each point on the screen there is a final value in the gray scale of the image's display, which is in some cases an average on account of overlap. Unusual effects are produced that would not occur in a print environment, such as the lightening of an area where a letter makes a light opening in a dark field rather than closing or covering another. There is, in some sense, more transparency in this *Veil* than in the other, but the texts no longer retain their replete autonomy. Even if they are unrecoverable, unreadable, in the printed *Veil,* they are fully present in some ontological sense. In the electronic *Veil,* this is not the case. There is a history of placement/displacement in the layering of one block of electronic text after another; one can discern the "top" frame by the fact that its autonomy is not disturbed by intruding texts. In a page-description language, this history might be encoded. In a GIF or TIFF file, it is completely lost. The immaterial substrate, a mere display of code, has eliminated the production history and process, thus configuring a loss of information as its imaged form. This is a new *Veil*—the screen between production and display, between a history of production and its immaterial encoding, between a text-as-image and the graphical end result of a series of now fully absent manipulations whose trace is the result but which are not recorded in the material of the text. The palimpsest is both real and illusory. In the immaterial condition, it lacks all recoverable dimensionality. The text is configured as patterns, not object (in direct contrast to Glazier and Rosenberg), creating a veil which screens and filters the linguistic sense through immaterial means. What is the "essence" of the language in this

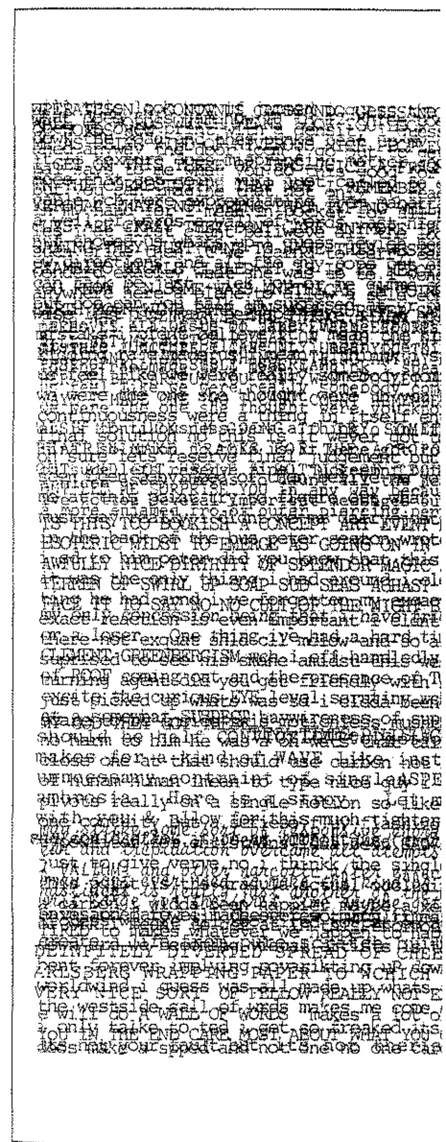

Figure 6. Charles Bernstein, from *Veil* (1976; Xex
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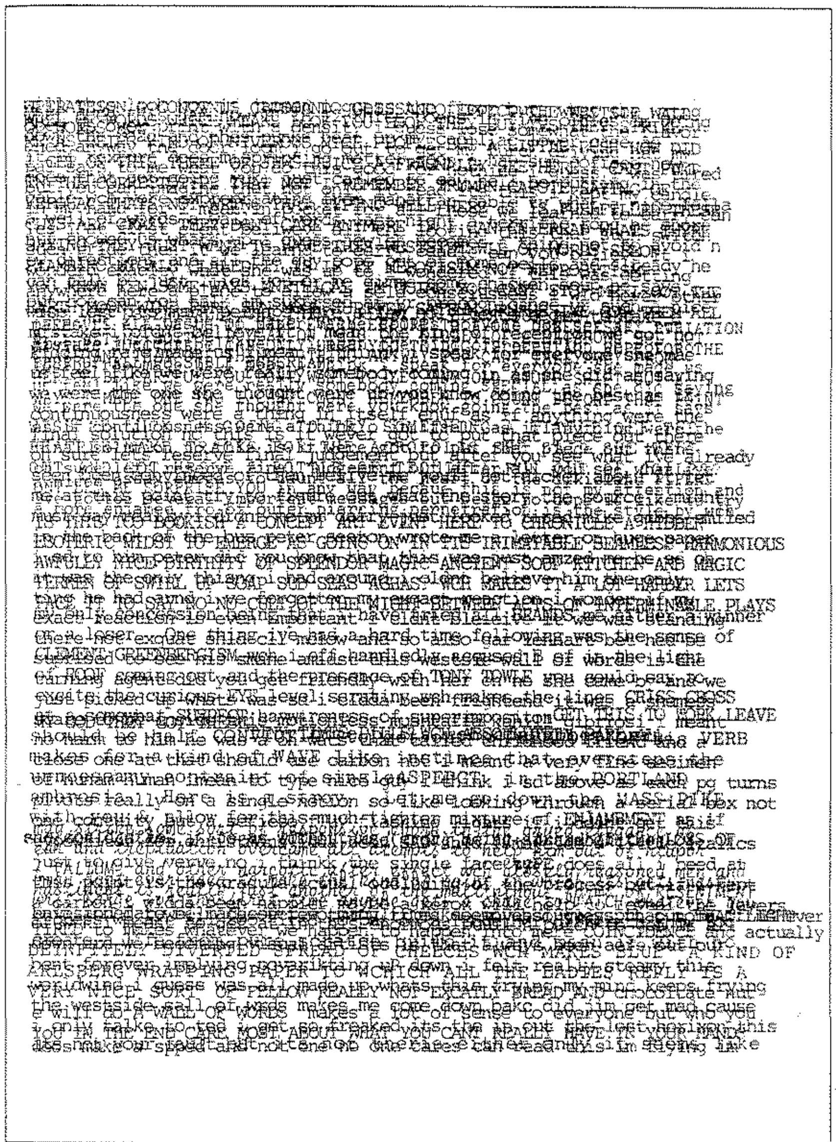

Figure 6. Charles Bernstein, from *Veil* (1976; Xexoxial Editions, 1987, Madison, Wis.), print version from typewriter script. (Courtesy of Bernstein)

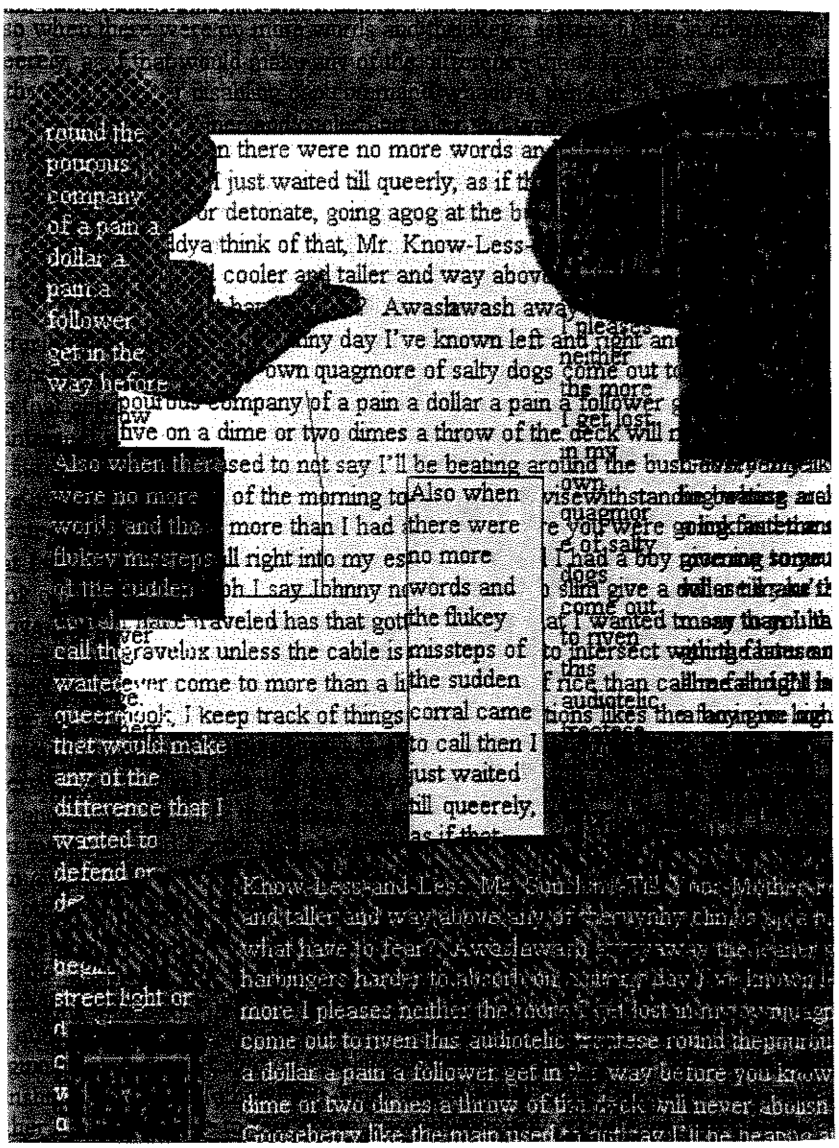

Figure 7. Charles Bernstein, from *Veil* (1996, Buffalo, N.Y.), on-line version. (Courtesy of Bernstein)

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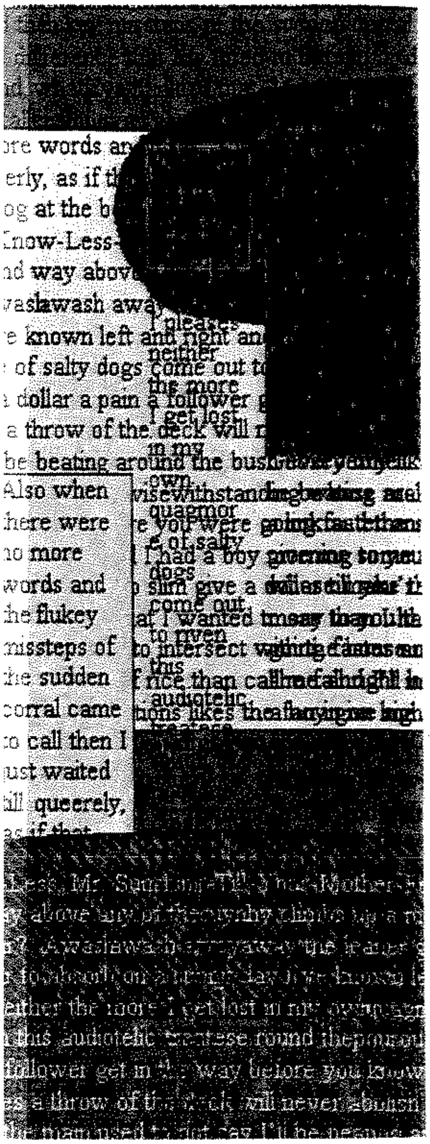

Buffalo, N.Y.), on-line version. (Courtesy of

case: its lost or unrecoverable form, its inherent but unreadable meaning, or its newly configured form as visual effect?

The challenge of three-dimensional display modes introduces a problem of legibility, in that the visual distortion of typographic form is ill suited to the eye trained to recognize the shapes of letters on a page. The manipulations, though interesting as graphical effects, seem to struggle for effect at the expense of increased meaning value. So much programming is required to manipulate the texts as dimensional forms that most modeled "virtual" poems (e.g., the holograms of Eduardo Kac or the entropic works of Ladislao Pablo Györgi[17]) are still more intriguing as novelties than as poetic works. However, the idea of a schematic "topography" as elaborate as a clinical storage cabinet or a detailed map—or an architectural diagram for a highly organized series of spaces—seems a more promising possibility for graphical schemata for virtual documents and archives than is the dimensional modeling of letterforms and text. VRML models of spatialized imagery have potential as models of archival storage and structure because they offer complex organization in a visual form that is sufficiently familiar to be navigated intuitively while taking advantage of the way space can be read as logical order. Such spaces need not be simply schematic or sterile; the detailed topography of surface maps or dimensional models can be rendered lucid by following familiar pictorial conventions.

The question of whether a letter's identity is an essential or differential attribute of its form, and the question of configured graphical meaning, are not the same as the question of "ideality" of meaning in a linguistic text (the arbitrary nature of the linguistic sign is a long-resolved issue, and assessing the "form" of a linguistic sign in relation to the notion of transcendent meaning is not the same as assessing the inherent form of a visual alphabetic symbol). But all these questions are concerned with the functional link between form as it appears to cognitive consciousness and the "sense" produced in grasping that form. The "configured" logic of thought is not a priori, or anterior to the formation of symbols, but is made in the process of their being inscribed in consciousness as forms. The twentieth-century philosophical extension of inquiries into the logical potential of language initiated in Gottfried Leibniz's search for a "calculus of thought" continues the investigation wherein logical, mathematical formulation tends to be conceived of as closer to an "ideal" than is quotidian language with its ambiguous, subjective character. Although the "ideal" objects of mathematics are obviously different from the imprecise and culturally dependent objects of language, at the level of *sense* the same questions can be asked of each. How is sense *form* in some fundamental way, such that an idea is grasped in form-as-sense in cognitive terms? Configured meaning draws both on ideal mathematical form and on contextualized cultural elements of language because it is precise (as structure) but impure (not readily translated into either binary code or computer program language). A quick history of natural and machine languages in the electronic environment will help to explain this combination of properties.

Language(s) in the Electronic Environment

In electronic media, "language" has evolved along two distinct trajectories with overlapping agendas, and neither has taken into account the way graphical configuration factors into the production of linguistic meaning. These trajectories are, first, the evolution of highly constrained, rule-bound, and logical forms of "language" which are instructions readily translatable into machine code (logical statements which ultimately can be stored as binary signals), and, second, the attempt to make machines understand "natural" language. In the history of computational devices, the leap from gears connected to cogs and axles (the basis of Blaise Pascal's calculating device) to sequences of interconnected switches would have had very little impact were it not for two things: the possibility of logic, using "natural" language in constrained form to function as a set of precise instructions translatable into mathematical equivalents; and the possibility of encoding these mathematical equivalents in a binary form corresponding to the fundamental on/off of current in an electrical gate/synapse/circuit. Curiously, both of these lend themselves to configurable form—to representation in the diagrammatic languages of logical statements, themselves largely translatable into the visual schemata of set theory diagrams (the familiar Venn diagrams). The fundamental terms of logical constraint—commands such as AND, OR, NOT, NAND, and NOR—can be visualized. Their elaboration into more complex sets of instructions quickly moves the logical configuration of the program out of the realm of any practically realizable visualization—but only in practice, not in theory.

The linguistic properties of the lineage stretching from Gottfried Leibniz in the eighteenth century to George Boole in the nineteenth and Gottlob Frege and Rudolf Carnap in the twentieth provided a means whereby linguistic terms could be made compatible with computational acts, and even their basis. It was this basic rule-boundedness that allowed Alan Turing and John von Neumann to interlink the concepts of "reasoning calculus" with that of the "automata" of computational machines, as Turing realized that logical/mathematical symbols could be made to represent any kind of information through the effect of translation into machine code. This, of course, is the key. In computer programming, ultimately *all* computer languages have to translate into machine language, binary sequences that give specific instructions to data stored in various address locations to perform

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particular tasks in a particular sequence.[18] Even a quick reading of a line of machine language shows how little these strings resemble "language" as we know it, and this is just the point. Machine language, computer language, and programming languages are all able to contain information—to function as a descriptive metalanguage that is not information, but rather a highly constrained and specific means to encode it outside of material form.

Natural language and the parsing of syntax resist the algorithmic and logical translation. The first peak of enthusiasm for the project of a direct interface between natural language and computers occurred in the late 1960s and early 1970s. Noam Chomsky and a generation of structural linguists working in computer science, information science, and linguistics proper struggled to discover rules of syntactic and semantic functioning which could, in turn, be programmed into a machine. Since these rules were necessarily simple enough that a child could learn them, the rules of language must be able to be systematically described and understood. The deceptive simplicity of the problem turned out to conceal pitfalls and conceptual flaws so profound that they could not be overcome. It became apparent that the "sense" of a simple English sentence relied to a great extent on the experiential database of the speaker. The resources of linguistic computing were inadequate to solve the problem of programming comprehension as a set of algorithms—a set of procedures that could be carried out without any information beyond what was needed to perform the operations in a procedural sense. Was this attempt to analyze natural language foundering merely because it required too much in the refinement of a programming apparatus? Were the crudeness of result and the impasse reached in these early struggles merely a result of the conceptual jags in a model too gross to imitate so complex a process? Ongoing experiments in this area take as a point of departure the premise that a sufficient exposure to language will eventually create the context necessary for comprehension—a rich, replete verbal field. In the interim, however, we are left with the philosophical issue that natural language is not merely machine-incompatible, but also that basic properties of syntax which operate within natural language cannot be translated into fully logical principles.[19]

Code, Immateriality, and Configuration

When we consider language in the electronic environment, it becomes evident that, in one sense, the assumption that the electronic environment and the condition of pure, binary code are themselves "immaterial" is false. There is an apparent paradox, which Matthew Kirschenbaum has described as that between the "phenomenological materiality" of the text and the "ontological immateriality" of its existence.[20] We perceive the visual form of the letter on the screen as fully material—replete with characteristics, font specifications, scale, and even color—even though the "letter" exists as a stored sequence of binary digits with no tactile, material apparency to it in that fundamental condition. The paradox can be inverted as well: electronic current, hardware, and the support systems of the code are materially more complex than any pen and pencil on paper. And even at a fundamental level, the nature of code is not immaterial; it functions as a temporarily fixed and infinitely mutable binary sequence which must and always does refer to place within the structure of the machine to allow the program or protocol to operate. "Code" always contains a stored electronic sequence that includes the address of any particular piece of information. Thus, the binary sequence, the ultimate "difference" that constitutes the identity of any data in code storage, is also always topographic, place-specific, sited, and therefore a location within the mapped territory of the machine's circuit/real estate. Or, to cite the historian of computer science René Moreau, "No item of information can have any existence in the machine unless there is some device in which its physical representation can be held."[21] Code is material, and its materiality has implications at the most basic level of the inscription of that difference for a notion of *configuration as information*. Though not inherently or specifically visual in and of itself, this "configured" condition *is* fundamentally *visualizable*. Both binary sequence and the topographic location of code storage/machine address are representable in diagrammatic form as images, maps, or locations.

What does this mean? On a fundamental, binary level, code is linked to configuration—literally, schematically, and metaphorically. Whether it is organized into computer language, or controlling protocol, describing the paths of data gates, of logical circuits, or schematizing set theory from instructions and constraints in programs, the configured character of electronic information is fundamental to its identity at this most basic ontological and functional level. But this realization immediately raises another set of questions: To what extent can such "forms" (visual and graphical in their manifestation, mathematical and electronic in their ontology) be "read" as sense? At what point does the relation between form and sense get formulated? Where does "form" emerge and come into "sense" in the most basic operation of machine process, and how does this relate to the human cognitive process in which such forms are originally conceived? The electronic condition of form seems to return immediately to these fundamental and original questions. The very idea that one might get at the essence of form, at the essence of meaning in some mathematical/configured sense, and thus to the basis of cognition/thought as mathematics is part of the mystique of the electronic environment. Metaphors of brain and computer similarity, of the mind as machine, and of thought as a programmable set of algorithms

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or as a product of neural networks processing data all inspire immediate fantasies. But under the sci-fi and popular culture imaginings that spring from this source is a philosophical issue that can be approached more seriously. Jacques Derrida's reading of Edmund Husserl's *Origin of Geometry* addresses the essential question of how form—particularly "ideal," mathematical form, in the instance of the "first" geometer—arises to cognition, and then establishes the basis on which the possibility of historicity can be premised. The problem of form coming into sense within cognition is the area in which the issue of configured meaning first arises (if "first" is thought of as necessary to what follows rather than primary or temporally precedent).

It is useful to backtrack into classical philosophy for a platform on which to consider this problem. Aristotle's description of "sense" was linked to form. He suggested that form was what allowed "sense" to be grasped, to be perceptible to sentience. There might be any number of things—from sensations to objects to stuff in the world—that did not find their way into form. But these were merely, de facto, whatever was not graspable as form; this "other" to form was not chaos, void, nothingness, or some other stigmatized *informe.* Aristotle's concern was with what made "sense" possible to human consciousness, and that was the "coming into form" of that sense. And this was the point at which it could be understood, at which there was "sense" and cognitive intelligibility. Husserl focused on those forms that, by their "ideality," exist independent of human cognition (geometric and mathematical forms, in his essay, are the exemplary and perhaps unique instance). Yet his consideration of their "ideal" existence, in contradiction to the Platonic tradition, has no particular meaning or value until it is grasped by human consciousness—the mythic "first geometer"—in such a way that this understanding can then be communicated. The ideal condition of being of a mathematical form poses a problem: Where does the form exist? Rejecting the idea of its residing in a spiritual mind (theologically or otherwise conceived), Husserl is intent on the problem of the way an ideal form appears to consciousness, as *ideal,* and as *specific,* and as a *form.* How is its ideality recognized? How is its form grasped, understood, and then communicated? In the case of geometry, this takes into account both the independence of the form from human cognition and its interdependence with cognitive apperception. Language, of course, raises other questions because the "ideal" aspects of its forms are less apparent.

In a footnote in the introduction to *The Origin of Geometry,* Husserl raises the question of whether mathematical form can be taken to be exceptional, or whether it is instead the actual condition of *all* form at some fundamental level.[22] This note opens the loophole through which the electronic configuration of information as meaning enters. For if the sensible forms that appear to consciousness are in some (however metaphoric) sense actually *forms*—configurable, mathematical, and specific—and if it is as forms that they provide the basis of sense, then are the forms in which electronic configurations occur "readable" and intelligible? And does the interchange between "code" and the topographically configured form of storage translate into an essential or a differential form?

It is perhaps a mistake, but at least an interestingly suggestive one, to conflate the notions of an "originary" grasping of sense—that which occurs as idea comes into form, inscribing a form through the process of *différance,* the differentiating that allows form to become specific—and of the initial inscription into code of the binary processes of electronic memory. It is equally facile to map the notion of "form" as a configured shape (mathematical and visual) onto the notion of the "topography" of the machine's physical structure. Nonetheless, making these connections at least allows a metalanguage of the code to emerge as a possibility. Eschewing any ultimate metaphysics, however, seems an important caveat in making these elisions; the "code" should not be read as transcendent, as "ideal," as a set of universal, independent, and autonomous symbols (any more than the alphabet should be construed as the fundamental elements of the cosmos). Rather, the nature of configured meaning within code (again, at the fundamental level of stored, binary sequences) should be read back into the material world in its variously layered interpretations: the first, meta-level of idea coming into being as form and grasped as sense, which I take to be the originary inscription of code; the secondary level, in which form is read as meaning, with all the complexities of iconography, symbolic imagery, and aesthetic inflection; and a third level in which style and specificity engage with ideology, with the specific historical, cultural, and institutional discourses of power.

When meaning is treated as transparent and materiality dismissed in the name of transcendent ideals, then the implications of these historical and cultural discourses are rendered unavailable, their full significance concealed behind dismissal and the characterization of triviality. I would argue, here as before and elsewhere, for the nontriviality of materiality in the visual, graphical information of the text—even (and maybe *especially*) within its (mis)perceived condition as *immaterial* in the electronic environment.[23] The "immaterial" is the gap of transformation, like what used to exist for the typesetter between the reading of a line in memory and its setting into a line of lead type, and what also exists between the material of text and its becoming that of sound, from sound to mind, from eye to voice, from hand to writing; this is also a basic characteristic of the way language *is* information in electronic form. It always precipitates back into material—mutated, trans*formed,* rewrit, as it were. Language is not ever *only* an ideal form. It

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always exists in some phenomenal form. In many previous works, I have insisted on the value of materiality, but I am also interested in the freedom from fixed relations of materiality. Ultimately, one of the intimations of immateriality is the way it promises to change material form—and, as such, offers possibilities for reconceptualization of language as information in the traditional media as well as in hypertext and electronic formats. The configured features of language seem poised to play an ever more significant role in these formats. From the level of code to that of program languages and then document structures and interfaces, the configured elements have a graphical aspect that contributes to the structured production of linguistic meaning.

Notes

1. Marisa Januzzi deserves credit for these two questions, which she asked following my presentation of a much earlier version of this essay at the meeting of the MLA in Washington, D.C., December 1996, at a panel organized by Mike Groden with Jay Bolter and myself. That version was published in my *Figuring the Word: Essays on Books, Writing, and Visual Poetics* (New York: Granary, 1998), 212–20.

2. If one thinks of an *A* in any mental image, the visual properties may be vague, but the *A*-ness of the letter remains linked, however weakly, to that visual icon and its specific characteristics. In the electronic environment, the letters of any particular keyboarded sequence retain nothing of their iconic value. The search for a font, a now familiar element of the writing task, used to be a specialist choice made by typographers or designers. The increasing familiarity of this task has sensitized a wider public to the implications of typographic style, though not necessarily to the truly peculiar condition of the text without alphabet or without written form which is its code condition.

3. Karen Sparck Jones and Martin Kay's *Linguistics and Information Science* (New York and London: Academic Press, 1973) is an example of the peak period of this sort of research in the field of linguistics; heavily influenced by the work of Noam Chomsky, it reflects the effort to analyze natural language systematically into mechanistic operations.

4. Daniel Crevier's *AI* (New York: Harper Basic Books, 1993) is a useful introduction.

5. "Language(s)" refers to natural and programming languages.

6. The notion of "ideality" of sense that I am invoking here is rooted in Jacques Derrida's reading of Edmund Husserl's *Origin of Geometry.* In using the term "ideality," I am trying to open consideration of the notion that an idea comes into form, becomes available to cognition, and thus participates in meaning production. "Ideality" is the condition of form when it is available to cognition but without materiality. See Jacques Derrida, *Edmund Husserl's "The Origin of Geometry": An Introduction,* trans. John P. Leavey (Lincoln: University of Nebraska Press, 1978 [1962]).

7. The idea for this as an example comes from Howard Besser's presentation at the Mixed Messages conference, University of North Carolina at Charlotte, October 1997, in which he stressed the difficult choices faced by librarians in the preservation of information.

8. Jerome McGann, Marjorie Perloff, Michael Davidson, Susan Howe, Steve McCaffery, John Byrum, Spencer Selby, Thomas Tanselle, Marisa Januzzi, Charles Bernstein, Matthew Kirschenbaum, Nick Piombino, and Rosmarie Waldrop, to name just a crucial few.

9. Donald Knuth, *Text and Metafont* (Bedford, Mass.: American Mathematical Society and Digital Press, 1979). Knuth, or so the possibly apocryphal tale goes, was attempting to resolve problems in typesetting mathematical texts which had made his publication projects prohibitively expensive. In trying to design faces he could use for setting mathematical equations, he quickly encountered the basic issue discussed here.

10. René Moreau, in *The Computer Comes of Age* (Cambridge, Mass.: MIT Press, 1984), defines an algorithm as follows: "A procedure for solving a problem when it came to be expressed as a sequence of statements of operations to be performed and when no knowledge or intelligence is required beyond what is strictly necessary for those operations to be performed" (3).

11. Douglas Hofstadter, *Metamagical Themas* (New York: Basic Books, 1985).

12. Adobe Type Manager and PostScript fonts are "managed" in this way; the various stages of drawing/designing fonts in Fontographer or Font Studio and other design programs use these principles. This still stops short of arriving at a single mathematical formula for an *A* or a *B* that would resemble a formula for a circle, a square, or a triangle of specified angles in which the formula and the "ideal" geometric form are identical, interchangeable, and unique, each containing the distinguishing characteristics of the form. Thanks to Gino Lee for input on this.

13. The word "object" has a specific meaning within computer science in that "object" programs are those in machine language (generally arrived at when "source" programs are "translated"). Thus, the "object" of an object-oriented graphics program contains very different information than does a stored image tapestry. The first is structural, the second merely a pattern.

14. Loss Glazier, "Command: Change Folder" (1996) URL: http://epc.buffalo.edu/authors/glazier/viz/command/command.html; Jim Rosenberg, "Intergrams" (Watertown Mass.: Eastgate Systems, 1993); Charles Bernstein, *Veil* (Madison, Wis.: Xexoxial Editions, 1987), on-line version URL: http://epc.buffalo.edu/authors/Bernstein.

15. Rosenberg, "Intergrams."

16. Bernstein, *Veil*, print and electronic versions.

17. Eduardo Kac, "Holopoetry," and Ladislao Pablo Györgi, "Virtual Poetry," both in *New Media Poetry, Visible Language* 30, no. 2 (1996): 184–213 and 158–163 respectively.

18. Compiled and interpreted languages each organize the relation between commands and data according to distinct specifications, but an assembly language is required to translate program code to the correct machine address so that the data can

be located and the functions performed. Su
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19. Library and information science res
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20. Matthew Kirschenbaum, *Lines for*
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21. Moreau, *The Computer Comes of A*

22. Derrida, *Edmund Husserl's "The Ori*
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23. Johanna Drucker, *The Visible Wor*
(Chicago: University of Chicago Press, 19
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be located and the functions performed. Such symbolic assembly languages evolved in the mid-1950s, but it took until the 1960s for higher-level interpreted languages (mainly descended from FORTRAN, which debuted in 1954) to evolve. Compiled languages allow for little intervention in the course of the carrying out of the program. By contrast, interpreted languages are not entirely in machine code—they have a front-end interface that can be manipulated by the user throughout. These higher-level languages allow users to take advantage of interpretive techniques to build the concepts as they go. But all these levels of accessibility are illusory in the sense that they are all equally constrained. If today a high-level language contains a simple "Delete" command, then ten years ago that read as "Execute Command D on Files G, H," and/or something like "del.exe.bat* to *." At that point, the combination of syntactics and mnemonics (that is, sequence and terms) involved is hardly more flexible, even if slightly more user-friendly, than the assembly level (L 3,x, M 2,y, A 3,w, ST 3,2) or the machine level (41 2 OC1A4 3A 2 OC1A8 1A 3 OC1AO and 50 3 OC1 A 4).

19. Library and information science research in this area continues to refine the search engines that make use of natural language syntax in an increasingly good simulation of syntactic understanding, but they still stop a long way short of full linguistic competence in any machine interface. A fictional version of this problem is presented in Richard Powers, *Galatea 2.2* (London: Abacus, 1991).

20. Matthew Kirschenbaum, *Lines for a Virtual T[y/o]pography,* URL: http://www.rch.uky.edu/~mgk/

21. Moreau, *The Computer Comes of Age,* 30.

22. Derrida, *Edmund Husserl's "The Origin of Geometry,"* 27: "whether the mathematical mode is the mode of every objects' constitution."

23. Johanna Drucker, *The Visible Word: Typography and Modern Art Practice* (Chicago: University of Chicago Press, 1994) and *The Alphabetic Labyrinth* (New York and London: Thames and Hudson, 1995).