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ABSTRACT

Legibility: How Precedents Established in Print Impact
On-Screen and Dynamic Typography

Heidi Specht

The printed word has been commonplace in society for over 500 years; the written word has been in existence for thousands. The primary intent of the written or printed word has historically been to be *read*. With that goal, rules and formats have developed over the centuries as aids to legibility. Naturally, these guidelines have been developed for the printed, or static typographic page. As our sophistication with and acceptance of technology grows, however, we increasingly turn to the computer or television screen for written information. Additionally, graphic designers and artists are questioning the role of the printed word as they explore the many technological advances that have moved type from the page to the screen. Formulas and guidelines that served the printed page may no longer be relevant. New typographic approaches are necessary to successfully integrate the visual word with new technologies.

Dedicated to my husband, Professor John B. Lamb, whose support and insight has enriched this project in innumerable ways.

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Legibility represents those qualities and attributes inherent in typography that make type readable. These attributes make it possible for a reader to comprehend typographic forms with the least amount of difficulty.
Rob Carter
Ben Day
Philip Meggs, 1993

Legibility, in practice, amounts simply to what one is accustomed to.
Eric Gill, 1931

You read best what you read most.
Zuzana Licko, 1989

If you ask a painter to define the most elemental aspects of her medium, the response might well be color and light. A potter might respond form and space. As a graphic designer, I would offer the time-worn pair of word and image, a pat phrase that has become so cliché as to not warrant much initial excitement; yet the study and energy spent on perfecting the form of the visual word is certainly as intense as that of any other art. Since the advent of writing, we have endeavored to represent the spoken word in visual form. Varieties of the alphabet have been in existence since the second millennium BC. In the past 550 years or so, (since the advent of the printing press) great attention has been focused on developing alphabetic forms and layouts for mechanical reproduction that facilitate the mental deciphering, or *reading* of these symbols. Tenets and philosophies of legibility have developed over the centuries that form the cornerstone of many typographic practices and curriculums. As culture changes and evolves, however, so to do our methods of communication. In the past several decades, new developments in technology and design philosophy have occurred that render many time-accepted principles moot, if not obsolete. With a nod to new philosophies, I propose that new technologies require new typographic principles, and that dynamic, or moving typography raises issues that are different than those found in typography existing in printed form.

There has been much study, primarily on the printed word, that gives a scientific basis for design and type arrangements that are easily processed by the eye. The design conundrum is that perhaps an easily absorbed message is not the point. In addition to the technological advances that have moved communication beyond the printed page; society in general has different expectations about how information should be

presented. As western culture evolves and the general pace quickens, we are bombarded constantly with information both visual and aural. It is the argument of some designers, notably Edward Fella and Barry Deck, that traditional letterforms and type arrangements no longer solve all the communication needs presented by a technologically hip, informationally-overloaded society. Edward Fella argues that even in a traditionally-perfect (by which I mean conforming to accepted design practices for readability) arrangement of legible type, perfect and absolute communication is an impossibility. Therefore, what is the point of struggling to create design that pretends it can communicate absolutely? The debate on legibility continues, and as the most respected names of our profession have chosen sides, it seems imperative that we as designers have a crystal clear idea of our purpose and goals, and the purposes and goals of our profession, lest we be labeled mere window-dressers.

An understanding of what constitutes legibility and the factors that enable a non-verbal word to be mentally processed seem to be a good foundation from which to start. The first section of this paper deals with the science of legibility. I have researched the physical process of reading, or how the eye operates and allows the mind to process the visual word. I have considered aspects of individual letterform legibility and the legibility of word and sentence structures. A very brief synopsis of letterform development has been included to give a historical perspective. Moving from the printed page, the next section deals with moving or time-based typography. Most of my typographic experimentation has dealt with multi-media and screen-based letterforms. Emotion and meaning can be conveyed by the physical actions of type which is not (unlike

type found in printed pieces), confined to or determined by the fixed edges of a physical surface. The final section deals with ideological differences in design that may determine a designer's decision to render a piece virtually illegible, whether it be dynamic or printed.

I. The Science of Legibility

How We Read

The eye reads in jerks, or what is known as saccadic movements. A thorough study of the physical act of reading has been published by Robert Spencer. He notes the following:

> [T]he belief. . .that we read as our eyes sweep smoothly along the printed line, is false. In reality, our eyes move along a line of print in a series of small rapid jerks, but because these movements are so fast no clear vision is possible, and perception occurs only during the fixation pauses which punctuate these jerks. Sometimes the eyes make a backward movement, called a regression. . . . Fixation and regressive pauses increase in number and duration when the reader encounters difficult ideas, formulae and equations, or unfamiliar words. Optimal typography causes the reader to make fewer regressions than typography of low legibility.[1]

This information was very useful to me in planning my thesis exhibition show, *Word/Image.* A line of type, with no word breaks, ran along the walls from the beginning of the exhibition to the end. This aspect of the show will be discussed in more detail in later sections of this paper; however, the form of this type was deliberately contrived to be difficult to read, and cause the viewer/reader to absorb the running "commentary" only with focus and concentration.

Perception is sensory impression plus meaning. Accurate perception enables comprehension.
To read is to obtain meaning from written or printed symbols.
Carter, Day, Meggs

Letters are signs representing sound in spoken language. The primary purpose of a letterform is to convey a recognizable meaning to the mind.
Carter, Day, Meggs

A letter may not be observed outside of its kinsman.
Goudy

Letterform Legibility

Many studies have been done involving the speed it takes a reader to recognize a letterform correctly. Analysis of eye movements is taken into account. Spencer also notes that certain letters in the western alphabet, particularly i, j, l, t, and f, are particularly likely to be misread due to their similarities in form.[2] In a geometric typeface such as Futura, these letters appear markedly similar. It was for this reason that I chose Futura as the typeface for the continual line of type in my thesis show. Because of the lack of spaces, the viewer had to decipher words from letterforms that might be identical. Especially in instances where a capital I fell next to lowercase l, the confusion was compounded.

Okwelll'lltellyou

Word Legibility

Beginning readers are taught to recognize sight words such as *and, the, to*, and *but* that are recognized quickly in their entirety. We tend to read by recognizing whole word shapes, and it is word shape and structure that either aids or hinders legibility. As Charlemagne recognized in 789 a.d. when he ordered all his court and church documents to be rewritten in half-uncial script, it is the ascenders and descenders of a word that greatly aid in legibility. That is why type set in all capitals is much slower to read: the eye does not have any differentiating word shapes to quickly recognize and identify words. However, the use of all capitals seems to imply emphasis and may be useful

to the designer despite its hindered legibility. Viewers to my thesis show said they began to read more loudly the passages set in all capitals; indeed, the words they were reading visualized words that had originally been shouted.

In considering word legibility, Spencer adds the following:

> Upper halves of words tend to have more differentiating characteristics than lower halves of words. Consonants tend to be "determining" letters more often than vowels in a word. We tend to recognize and read longer words more quickly than short words, except when the word is located in our peripheral vision, when the reverse is true. We find errors in the first sections of a word generally before we find errors in the last sections, probably because after we have recognized the word, our eye moves on.[3]

Professors Rob Carter, Ben Day, and Philip Meggs also offer numerous assessments on legibility in their book *Typographic Design: Form and Communication*. They note that "words are identified by their distinctive word shapes, strings of letters which are instantaneously perceived, permitting the reader to grasp content easily."[4] I was countering this principle of word recognition based on line length by having no spaces between words in my thesis exhibition. When confronted with a linear arrangement of non-breaking type, the viewer was forced to uncode each word letter by letter. In this way, the physical process of reading, or imparting information from letterform symbols was manipulated; the "casual reader" was eliminated,

Detail of the *Richard/Gail/Sean* piece. A single line of type is run along the wall and over the monitor pedastles. This allows the single row of static type to contrast with the dynamic typography on the screens.

and those who wanted to access the information on the wall were forced to "work for it."

On a final historical note, I think it is important to recognize that for hundreds of years, when type designers created a typeface, they were much concerned with the overall texture and "color" the type gave to the page. With that in mind, there is a correct letter and word spacing for each typeface that gives the printed page the texture the designer had originally intended. If the letter and word spacing is too great, that texture is destroyed, and the page looks spotty. If letterspacing in a word is too tight, legibility is hindered, as word pairs can be mistaken for other letters (think **c** and **l** forming a **d**, and **r** and **n** forming an **m**). In today's age of effortless digital manipulation, we can condense and expand words without much thought or effort. I think it is important to recognize the principle of texture as applied to a page. I do not think the concept carries over to the screen.

Sentence Legibility
Once a typeface has been successfully designed, the way it is placed on a page in larger amounts of text can either aid the viewer or decrease legibility. Because of the way the eye moves, it has been discovered that a line length of 10–12 words, or approximately 60 characters, is optimal. A line length that is too short slows perception and increases the number and duration of fixation pauses. While line lengths as short as a word are used very successfully in many layouts, notably in those of concrete poetry, the average book reader would probably not appreciate wading through a long text set in this manner. A line length that is too long causes the eye to lose its way and greatly increases the number of regressions.[5] This could be said to

decrease the readability of a text. Each word in a sentence still maintains the integrity of its letterforms and thus, the legibility imparted by them. But by altering the arrangement of words, the speed or ease with which a sentence can be read, its *readability*, can be dramatically altered. Carter, Day, and Meggs agree: "An appropriate line length is essential for achieving a pleasant reading rhythm, allowing a reader to relax and concentrate on the content of the words. Overly short or long lines will tire a reader. Excess energy is expended when reading long lines. . ."[6]

MFA thesis exhibition show *Word/Image*, Laura Mesaros Gallery, West Virginia University, April 2000. Image is a detail showing the continuous line of type running across the *Sean* pedastle.

I experimented with this concept in my *Word/Image* show. By removing the spaces between words entirely, and running the resulting one line of type around the entire gallery, I was able to greatly decrease the readability of this text. New words were created by the resulting new combinations of letters; however, the original sentence was still legible. Those attendees who were willing to spend the time were able to follow the trail of words around the gallery; by context, the correct word could be established wherever there was a choice to be made. A group of ten-year-old children was able to read the text in this manner, using their fingers to mark out the words as they traversed the gallery.

Room view of MFA thesis exhibition show *Word/Image*, Laura Mesaros Gallery, West Virginia University, April 2000.

The space between two lines of type, also known as interline spacing or leading, is another important factor in legibility. Carter, Day, and Meggs believe the following:

> Proper spacing carries the eye naturally from one line of text to the next. If the spacing is too close, the eye tends to see multiple lines of type as clumped together; if the spacing between is too great, the eye has difficulty finding the next line. Type size is also a factor. If type is set too small, the counterform relationship in a letterform is compromised, and visibility is reduced. If the type is set too large, a reader can only see sections of the text at a time, which forces the eye to continually reorient itself to the page. Research has shown that for the printed page, viewed at a distance of 12 to 18 inches, a type size of 9–12 points, with 1–4 points of leading, (larger x-heights require more leading) is the most legible.[7]

Influences from Manuscripts

From the 5th century b.c. to the 15th century a.d., books and written materials were a product of scribes. As with any hand-made product, the success of the finished work depended largely on the skill of the artist. Judging from the manuscripts that

have survived, there were wide ranges in the skill level of scribes. Of course, the manuscript itself allowed for wide variations in spacing, spelling, and grammar. Once the layout of column width and number of lines and spaces needed for illumination was established, the scribe would do his best to fill the columns with evenly drawn letters. Latin, the language most commonly used for these kinds of documents, allowed for multiple abbreviations. Scribes would think nothing of leaving out large parts of words to stay within the layout and maintain the visual evenness of the page. These abbreviations did not really affect the legibility of the page; many of these manuscripts were intended to be read aloud, and both the scribe and the intended reader had a firm auditory memory of the words. The manuscripts were not intended to be read verbatim, but served as visual cues for a text already committed to memory.

Scribes used a number of scripts, which varied according to region, type of manuscript being produced, and the skill level of the scribe. An attempt was made in 789 a.d. by Charles the Great to standardize and improve the legibility of the written manuscript. The king ordered all his court manuscripts to be rewritten in a half-uncial hand (largely attributed to Alcuin of York) which, with its ascenders and descenders, was an improvement that greatly increased legibility.

The Printing Press

When Gutenberg began his major printing effort, he naturally sought to compete with the scribes and imitated the manuscript form with his printed masterpiece. The same textura face that was currently being used by scribes was used as the typeface. The line and letterspacing of manuscript Bibles were rigorously preserved. This required over 200 special characters and ligatures

to be cut to get the same texture and fit as the scribal product. Despite its masterpiece status of today, Gutenberg's Bible was not received without negative comment. As one critic denounced it, "it looks like writing, it clearly is not writing, therefore it is imitation writing."[8] This critic might be alluding to Gutenberg's failure to redefine the form of his Bible to more closely align with the new production method. Similarly, we may be repeating Gutenberg's errors. A printed letterform is not the same as a written letterform and therefore, needs new standards and formulas. In the same way, type viewed on a screen is not the same as type on a printed page; logically it needs to be addressed in a different manner.

Section II

On-Screen Legibility
While most of the research that has been done on the legibility of type has focused on the printed page, on-screen type presents new challenges and situations. In addition to the technical difficulties that always exist at the dawn of a new communication media, dynamic typography, by its very nature, negates many principles that can be applied to static typography.

Twenty years ago, there were technical considerations that needed to be addressed concerning type resolution. Forced to conform to the limitations presented by the low-resolution screen, letterforms appeared very pixilated and bitmapped, their attractiveness necessarily compromised by technology. Quick to address the need, designer Licko began experiments with on-screen typography, developing new letterforms specifically designed for low-resolution applications. (As monitor resolutions improved, Licko developed new faces, and eventually

added post-script designs to her bit-mapped offerings). Probably because Licko intended that her new faces be printed, and therefore exist off the screen, reaction to her experiments was harsh. Licko's new faces were denounced as unreadable by many prominent designers, who claimed her work "represent[ed] language breaking apart.[9] It was in response to this criticism that she put forth her beliefs that no letterform is inherently legible, that legibility develops with exposure to a form, and that the more we see a particular typeface, the easier it will be to read. (Designer Massimo Vignelli responded that we don't need anymore typefaces.[10]) At this writing, technological advances have improved on-screen typography to the point that appearance issues no longer exist. Assuming that the type managing component of a computer is functioning correctly, one can be fairly certain that if distortions exist, they are intentional.

MFA thesis exhibition show *Word/Image*, Laura Mesaros Gallery, West Virginia University, April 2000.
Three computer monitors in a row personifying Richard, Gail and Sean. Detail of Richard, Gail, Sean monitors, shown right, illustrates the progression and evolution of words, both written and spoken, across the 3 monitors.
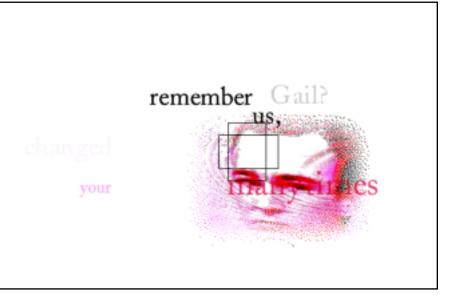
Dynamic Typography

Type that moves and changes on a surface requires modification of basic layout principles. Page designers of static typography are taught to activate the page through placement of the elements on it. First year design students can speak of principles such as hierarchy, rhythm, 'designing the white space' and activating the edges of a page. Designers can speak of the necessity of arranging elements according to importance, of creating a grid structure that allows for easy comprehension of information, and of how margin sizes can create a restful area of calm or typographic tension. All of these design principles and strategies would seem to require both a fixed edge and fixed elements that obediently maintain the relationships the designer has assigned to them.

In considering dynamic typography, one of the first issues seems to be that of boundaries. On screen, there are no defining edges. Of course, one is viewing a monitor or projection that has concrete edges, but as type moves easily on and off screen, the idea of an absolute barrier that one can "play off" doesn't work anymore. Instead, the impression of a computer monitor is that of a window through which we catch glimpses of elements that happen to move into view. As type moves freely on and off screen, traversing the screen edges without pause, there is a clear sense that there are elements interacting in a space beyond our vision. I incorporated this sense of an off-screen space in my show *Word / Image.* By setting the three monitors in a row and by having type move in the same plane and direction, I was able to convey the sensation that a word or phrase was originating on one monitor and then moving across to the next. While it was not possible to perfectly synchronize the computers, a brief delay from the disappearance of type on

Detail of the *Richard, Gail, Sean* piece, showing the progression of the word **manytimes**. Beginning on the *Richard* monitor, the word moves from left to right, fading away on the *Sean* screen.

Details of the *Richard, Gail, Sean* monitors illustrating the progression and evolution of words, both written and spoken, across the three screens. Note *More*.

one monitor to its reappearance on the next did not seem to significantly impact the effect. Because of other elements on screen, the viewer's attention was diverted from one monitor to the next; when the type reappeared on screen, it was recognized and incorporated into the existing action happening at that time.

Traditional concepts of establishing hierarchy (read "importance to the viewer") through the use of scale and placement on the page are also challenged by the use of dynamic typography. Even assuming that all typographic elements on-screen would maintain their initial sizes and positions (and what would be the fun in that?), the element that changes at all noticeably is the element that commands our attention. Think of a page that follows traditional typographic norms and uses type size and weight to establish an order of readability. It might even use space in such a way that the most important line to be read is prominent in the piece where our eye cannot help but be drawn to it first. At the bottom of the page might exist a footnote; its size and placement clearly indicating it is subordinate information. Now imagine that this footnote is blinking off and on. Our eye cannot help but be drawn to this changing, moving piece of typography; we will watch it to see what it might do next. If all elements on a page are blinking, moving, and changing, our eye will constantly be attracted to different elements. The way we

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might determine which is the most important is based on time as well as space. The item that can somehow capture out attention most strongly, either through its movements or the time it allows us to read it, could satisfactorily be labeled the dominant element.

The video clip of Sean looped several times, as did the lines of moving type that crossed the screen.

I used repetition of elements, or looping, quite frequently in the *Richard/Gail/Sean* computer pieces. Often times, especially in the Sean piece, type would move across the screen in multiples too quickly to allow the viewer to comfortably view it. The addition of a moving video background added to the difficulty in reading the words. As the transparency of the type altered as it moved across the screen, often the words would fade into the background image. If the viewer watched long enough, however, the repetition of background image and type would at some point in the process create a combination where each piece of type was readable. The video segments attracted the viewer's eye immediately. However, by repeating video segments and introducing type elements that were new and also changing, the viewer's eye was redirected to those areas.

The other aspect of dynamic typography involves a changing layout. In several type experiments I did with an animation program, I did not have the type moving, but instead animated other segments (lines and bullets) of the layout. When the viewer originally arrives at the screen, the largest type segments immediately attract the eye. However, a line emerges from a point and slowly moves across the screen. By the time the line has traversed the screen, a new segment of type is effectively underlined. This graphic emphasis changes the hierarchy of the

page; the underlined segment is now the first thing that draws the viewers attention. On-screen, a single layout is now changeable in ways that previously were only possible with sequences, or multiple layouts.

Section III

Purposes of Design

At the dawn of the new millennium (and how cliché that sounds only 2 months into it!) graphic design as a profession has not clearly defined its role in society. Having hopefully left the "commercial art" moniker far behind, we must still decide the reasons for the graphic decisions we make, whether they be on screen, on paper, or in some other new media that is yet to be realized. Designer Katherine McCoy believes that there are three different orientations that the design model could follow: "design as art, which is concerned with personal content and expression; design as science, which is concerned with the systemic presentation of objective

information, and design as language, concerned with the audience's reading or interpretation of text and content."[11] With the recent shows by Ellen Lupton focusing on the connections between design and culture in mind, we must by now accept that design is a "cultural activity," and that its vernacular is everyman's. With that in mind, we must decide what we are trying to say.

Design has its origins in a modernist tradition (discounting the commercial art frenzy of the Victorians). The Bauhaus school taught us that a clear understanding of purpose and an honest use of materials would lead to the correct form. Beatrice Warde, in her famous "crystal goblet" analogy, proposed the near-invisible container for the contents. Swiss schools advocated their ideas of objectivity, rationality and devotion to the nearly-invisible typeface Helvetica. The concept was hopeful: if every element could be arranged as clearly and as honestly as possible, the message could not be overlooked or misunderstood. Following McCoy's premise, this would seem to fulfill the design as science part of the equation.

A thorough training in modernism under their belts, the post-modern graduates of the early 80's seemed to rebel *en masse*. Rejecting the "authoritarian voices of modernist typography,"[12] they sought alternate modes of expression, developing new typefaces and layouts that seemed to deny the importance of readability. "Legibility presents information as facts rather than as experience,"[13] claimed typographer /designer Phil Baines in 1991. Indeed, design curriculums themselves, notably Cranbrook College of Art in the 1970's/1980's, challenged the notion that a printed message could exist as an absolute. McCoy posed her challenge: "which has a primary call on the

design elements, the relationship to the person involved, or expression of the structural components?"[14] Linguistic theory had begun to enrich design methodology, and the idea arose that perhaps it was not possible to speak the same message to all. Cranbrook advocated the creation of pieces that developed a dialogue with the audience, that "created a visual transaction that parallels verbal communication."[15] Designer Edward Fella, who was attending Cranbrook at the time, expanded on the idea of multiple levels of communication and claimed that his work simultaneously existed on multiple culture levels, (for example, the flyer stapled to a telephone pole announcing a local band, which could also be expensively printed on quality paper and mailed to executives and art patrons) ostensibly offering similar levels of messages to viewers as well. This nature of design seems to exemplify McCoy's design as language component.

The third division, design as art, seems to be where the heights of illegibility are approached. With the focus on the designer as creator and the design piece as a personal expression of content (read *art*), the traditional requirements of readable type are not only challenged, they are discarded. Using techniques such as overprinting paragraphs of text so they cannot be separated, much less read, designer David Carson simultaneously delighted and disgusted the design community. While there were many who delighted in the novelty of Carson's word as image abandon, there were many other designers who felt that Carson was indulging in "type as entertainment," where "the designs function decoratively as a means of . . .amusing,. . .rather than as vehicles for extending meaning or exploring the text."[16] In Carson's work, the type is interpreted as art, and the emphasis is placed on Carson, not the design solution (as it is in func-

tional modernism) or the reader (as it is in pieces that try to establish a dialog through viewer interpretation).

The creation of a dynamic type medium introduces the element of time into those illegible art pieces. As viewers of television, we are used to an increased pace of visual information. We are used to blurry and degraded and otherwise corrupted type forms. We largely expect the illegible type to somehow resolve, or "uncode," itself before our eyes if it expects to be read. As designer Max Kisman says, "human beings have always been inundated with visual information. We have gotten very good at screening out that information we deem to be nonessential."[17] As designers, it is our task to be fully integrated into the society that we serve. In addition to a thorough awareness of design history and the technological know-how to put our thoughts into practice, we must be aware of the contexts in which we operate. A solution is not successful because it uses the newest in technology or style. Typographic exercises that morph and move in fantastic ways are useless as word information if they cannot actually be *read*. It is the designer's challenge to incorporate the peculiarities and potentials of new media into forms that people are able and willing to access.

New developments in technology and radical changes in design philosophy have dramatically challenged traditional notions of legibility. The advent of the personal computer has put desktop publishing capabilities into every home, allowing anyone who is interested a crack at typeface creation and manipulation. The biggest challenge to legible type, however, may emerge from graphic designers themselves. As graphic designers continue to toy with the concept of word as image in ways that confront

the dictionary definition of *word,* they will also have to confront their reasons for doing so. The answers may lie beyond the stylistic drawing board, and force the designer to consider her philosophies, purposes, and perceived role in society.

Endnotes

[1]Robert Spencer, *The Visible Word*, 2nd Ed., (London: Royal College of Art, 1969), 19.

[2]Spencer, 25.

[3]Spencer, 13.

[4]Rob Carter, Ben Day, Philip Meggs, *Typographic Design: Form and Communication*, 2nd Ed., (New York: John Wiley & Sons, Inc., 1993), 88.

[5]Spencer, 35.

[6]Carter, Day, Meggs, 90.

[7]Carter, Day, Meggs, 90.

[8]Stanley Morison, *The Typographic Arts*, 2nd Ed., (Cambridge: Harvard University Press, 1950), 59.

[9]Rudy Vanderlans and Zuzana Licko, *Emigré: Graphic Design into the Digital Realm*, (New York: Van Nostrand Reinhold, 1993), 52.

[10]Ken Cato, Ed., *First Choice*, (Roseville East: Craftsman House, 1996), 243.

[11]Stephen Heller, Ed., *The Education of a Graphic Designer*, (New York: Allworth Press, 1998), 10.

[12]Rick Poynor, Ed., *Typography Now: the Next Wave*, (London: Booth-Clibborn Editions., 1991), 8.

[13]Rick Poynor, Ed., 16.

[14]Hugh Aldersey-Williams, *Cranbrook Design: the New Discourse*, (New York: Rizzoli International. Publications, Inc., 1990), 12.

[15]Hugh Aldersey-Williams, 15.

[16]Rick Poynor, Ed., 15.

[17]Peter Bilak, *An Interview with Max Kisman*, (http://www.typ.nl/TYPO5/would/illegibility/illegibility06.html 1995), 1.

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