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Communication Theory and Typographic Research

Randall Harrison and Clyde D. J. Morris

The term "typographic research" may be taken in three related but quite different senses: 1) as in testing scientific hypotheses, 2) as in artistic exploration, and 3) as in critical, historical, or analytic examination. Working primarily within the framework of scientific research, the authors attempt to sketch typographic research within the broader picture of scientific theory building. They recast a few familiar aspects of typographic decision-making into the framework of communication theory. The primary goal of the article is to suggest what might be useful for a theory of typographic communication, including research needs and criteria for arranging a hierarchy of research goals.

In the best of all scientific worlds, the researcher finds the "critical experiment" to perform, the situation where two competing theories lead to conflicting predictions, and an experiment can demonstrate which prediction is accurate. A complex theory, of course, is a hearty beast, and it seldom rises or falls on a single experiment.

The researcher, in his best form, also performs the "high information" experiment. He lines up all possible alternatives and then tries to do the crucial experiment which reduces the alternatives by half. If he can find these key forks in the path of discovery, he can eliminate huge areas of potentially time-consuming—but eventually fruitless—research.

Finally, of course, the researcher would like to do the socially significant experiment. The social scientist would dearly love to come up with an experiment which would demonstrate how to eliminate war, or erase poverty. Unfortunately, the path of science has typically led the researcher to molecular levels. The great intellectual questions of history have usually given way only after intense, and usually increasingly molecular, spade-work.

The classic scientist frequently ends up humbly adding his one brick to the intellectual stockpile from which someday—possibly not in his

lifetime—a new theoretic edifice will be constructed by some future Charles Darwin or Albert Einstein. The practitioner who wants some shelter from uncertainty today is likely to look at the bricks with scorn: "You call that a building?"

Admittedly, of course, some scientists discover things which are very useful to today's practitioners. In areas like communication research, the practitioner frequently complains that the scientist has discovered what bears signs of pertinence but has little interest in communicating the implications of his work. The scientist, meanwhile, expresses frustration that the practitioner does not learn a minimal scientific vocabulary so he can draw his own conclusions.

For the scientist then, typographic research suggests the testing of hypotheses. This is in contrast to the artist, who engages in his kind of typographic research when he creates new forms or explores new methods, such as computer-aided design. It is typically different also from historical or critical research, although increasingly, historical research has been framed in a hypothesis-testing context.

Working within the framework of scientific research, then, let us examine the current state of communication theory and its implications for typographic research. And, conversely, we'll explore the implications of typographic research for emerging communication theory and practice.

Communication Theory

In its broadest sense, communication involves that process whereby one system passes information to another system. Any system—whether a subhuman organism, a person, or a large institution—exists in terms of energy, matter, and information. A system typically needs: (a) information from within, to control and co-ordinate its parts; and (b) information from without, so it can adapt to and affect its environment.

Information can be thought of as that which reduces uncertainty. Uncertainty, in turn, is a function of the number of alternatives available, and the probabilities attached to those alternatives. Uncertainty increases as the number of alternatives increases; it's harder to select among three equally attractive possibilities than between two. Uncertainty also increases as the probabilities become more nearly equal; it's harder to choose in an equally weighted ("50–50") situation than in an unequally weighted ("90–10") one.

Information typically passes the boundary of a given system in coded form. It is a pattern of stimulation, in the form of matter or energy, which "means" something, i.e., it can be decoded for re-creation outside the system. The code, particularly in complex systems like the human being, can mean several things, on several levels, at the same time.

If we are talking about a human communication system, we can label the parts more specifically, as D. K. Berlo (1) does in his S-M-C-R model (Fig. 1). The model suggests a source, message, channel, and re-

S	M	C	R
Source	*Message*	*Channel*	*Receiver*
communication skills	elements	seeing	communication skills
attitudes	structure	hearing	attitudes
knowledge	code	touching	knowledge
social system	content	smelling	social system
culture	treatment	tasting	culture

Figure 1. SMCR Model of Communication

ceiver. For the source and the receiver, certain characteristics are seen as important to successful communication: knowledge, attitudes, communication skills, and the social-cultural context.

The message may present content in one or more codes. The human source in his selection of codes and contents gives the message a unique "treatment." In code, content, and treatment we can identify elements and structure. Typically, elements at one level, such as letters, join together to form a structure, such as a word, which becomes an element at the next highest level of analysis; the word is an element in a sentence.

When we think of human code systems we usually think first of alphabetic or numeric codes. But man can and does use a wide variety of code systems. Figure 2 shows a set of code systems suggested originally by Martin Krampen. In addition to these, Edward Hall (5) (6) suggests that time and space can be patterned into code systems. The latter he calls "proxemics."

Related to the problem of codes and content is the notion of "metacommunication." Metacommunication is communication about communication, messages about the message which are often transmitted simultaneously. In other words, a source may encode a message about some topic, some content area. At the same time, through his tone of

voice, through his gestures and expressions, he makes some statements about his message and how it should be interpreted. "This is important." "I mean this especially for you." "I'm very serious about this." Or, "I'm just kidding."

Fundamental motor act	*Basic (differential) unit produced*	*Combined into*	*Studied by*	*Typical act or skill*
uttering	phoneme	morpheme	linguistics	poetry
scratching	glyph	glytomorph	glyptics	writing
	pict	pictomorph	pictics	drawing
molding	plasm	plastomorph	plastics	sculpture
building	technem	technomorph	tectonics	architecture
moving	kine	kinemorph	kinesics	dance
sound	tone	melos	melodics	music
touch	hapton	haptomorph	haptics	fondling
produce smell	ozone	aroma	aromatics	perfumery
produce taste	edon	edomorph	edetics	cooking

Figure 2. Code Systems

Alongside linguistics has grown up an area called "para-linguistics" which studies rhythm, pitch, tone, and the other qualities of a spoken message which often provide metacommunication. Originally, kinesics, the study of gesture, was subsumed under para-linguistics. But now it appears that there may be a kinesics and a para-kinesics. Pounding the table with a fist may indicate anger. But the force and speed of the pounding may be a para-kinesic cue which indicates just how much anger.

Similarly, there may be a para-graphemic area. Bold-facing, changes in size, and alterations in space may provide metacommunication just as para-linguistics or para-kinesics.

Uncertainty in the Communication System

When we examine a communication system as objective observers, we may have certain questions about the system itself, certain types of uncertainty that we would like to resolve. We may wonder, first, if the system actually works. Is it possible for one component to pass information to another? If the source and receiver do not share a common code system, a common language, we might predict that our system will not last long.

We may be interested in predicting the longevity or stability of our communication system. To test this we might want to know the source's and receiver's attitudes toward each other. What is the receiver's attitude about the messages he receives? What is the source's attitude toward the messages he encodes? Do they fill him with expressive joy? Or are they ground out with painful effort?

We may also ask questions about the effectiveness of the system. When one component passes information to another component, does the information produce the desired effect promptly? Does the system acquire relevant information from its environment, and communicate back to its environment?

Given some reading on effectiveness, we may raise the question of efficiency. Is information passed with a minimal expenditure of energy and matter, with the least possible wear and tear on the components?

In theorizing about communication systems, we frequently move within the system to take the point of view of one of the components, typically the receiver, with an eye to eventually providing more information to sources about the communication process. If we examine the source, we may ask questions like: What leads him to select the messages he does? How does he choose content? Why does he select that particular code, or channel? Then we may go on to ask how he receives feedback from his receiver, or how he can be more creative or more productive.

Examining the communication process from the viewpoint of the receiver, we can identify several types of uncertainty, and we can find examples within typography. First may be the uncertainty of what was sent. This is the problem W. Weaver (13) has called the "technical problem," and it is dealt with explicitly in Shannon's mathematical theory of information.

In typography, this kind of uncertainty relates most directly to legibility. The course of this uncertainty may be (a) an ambiguous coding system, such as an ornate typeface where *C* can be confused with *G,* or (b) channel "noise," such as smeared printing, or even poor lighting conditions for the reader. Shannon used the term "noise" originally for audio channels, and of course, in television, we have "snow." Sir Cyril Burt (3) has suggested that in typography we should call the same phenomenon "blur."

"Technical uncertainty," as we might call it, is usually reflected, first,

in the receiver's error rate, i.e., his misreadings, and, second, in his decoding time, his reading speed. It may be possible to reduce this type of uncertainty, but frequently only at the expense of introducing other types of uncertainty.

A second kind of uncertainty Weaver called the "semantic problem." It is uncertainty about what was meant. In other words, the code is received pretty much as it was transmitted, but now we come to the problem of decoding, matching the symbols with some referent system.

In typography, the semantic problem has typically focused on typeface connotation. At one level, the individual symbol "means," or stands for, a certain letter of the alphabet, or for perhaps a certain sound in the spoken language. But in addition, the typographer can select a type style which communicates certain connotations. The typeface may be modern or old-fashioned, masculine or feminine, formal or informal, expensive or cheap, frivolous or stolid.

Frequently, the typographer must worry about connotative congruence. The message itself—with its particular content and treatment—frequently gives rise to certain connotations. The typographer in his encoding choices can (a) reinforce these connotations, (b) provide new and independent connotations, (c) offer neutral, or at least minimal, connotations, and (d) introduce conflicting connotations.

The latter choice may sound like poor encoding, but a conflicting connotation may be selected to provide counter-point, to heighten some hoped for effect. Usually, of course, a direct conflict would be expected to produce confusion, and it would most likely dilute the original connotation of the treatment and content.

A third type of uncertainty may be called the "syntactic problem." Particularly in complex messages which permit more than one decoding sequence, this uncertainty becomes important. Roughly, the syntactic problem is uncertainty about symbol-to-symbol organization. What do I look at first? What is most important? If I'm skimming, what can I skip? In general, how do I get from the beginning to the end?

Print is, of course, a linear code. You usually start at the upper left, scan across, then drop a line, and so on. But in any complex layout, typography can be used to guide, emphasize, and organize.

A fourth kind of uncertainty relates to arousal and to the aesthetic response. D. E. Berlyne (2) suggests that arousal can be stimulated by

patterns which are complex, novel, conflicting, intense, colorful, and so on. Moderate rates of arousal, in turn, can be related to pleasurable feelings which may be at the core of the aesthetic response: "I like it."

Usually, the aesthetic response is thought to be a function of connotations, i.e., pleasant associations from the past, and perhaps congruence, a particularly appropriate organization of elements. In the area of typographic preference, some individuals may demonstrate a liking for that which is easy to read. If we add connotation, congruence, and legibility to arousal, we may have accounted for the key facets of typographic preference.

A fifth and final type of uncertainty may be proposed: response uncertainty. Given our knowledge of what was sent, how to decode it, what it meant, and our immediate pleasure or displeasure in it—now what is the appropriate response?

In one sense, this question is at the fringes of the decoding process and tends to be less under the control of the message and more under the control of the individual's psychological state and social-cultural context. But we have suggested that, through metacommunication, the source can tell the receiver how to interpret the message, and, by inference, how to respond.

At one level, a message may contain explicit instructions. "Turn to page 320." "Clip along the dotted line." "Give this coupon to your grocer." At a subtler level, a magazine may use a specific typographic treatment for one type of article or feature, so that the reader will tune in again next time to the right place. Or the advertiser may invest great meaning in his logo so that at some future time the reader will "turn in at the sign of. . . ."

Typographic Decisions in the Communication System

In a mass-media communication system, the typographer is usually a member of the encoding team. He stands between the original source of the message and the channel which will carry the message to an audience. He may exercise relatively little control over certain aspects of content but considerable control over certain code and treatment options.

The original source of the message probably holds certain goals, a set of outcomes he deems desirable for his message. He probably hopes for, first, attention. He would like a set of receivers to select his message

out of the array they have available. Next, he would like some measure of comprehension. Then, he would probably like acceptance, favorable attitudes for his position and ideas. Next, he may want recall of this information at some future point. And finally, he may hope that the information is used in some specific way.

The source may, of course, be interested only in expressive success. He may be venting feelings with little concern whether they have an instrumental effect on an audience. Or, he may appear to be concerned primarily with pleasing his employer and collecting his check. Even here, however, his message must have some of the desired effects on an audience.

Various sources can be typed by the relative importance they place on attention, comprehension, acceptance, recall, and use. The entertainer, for instance, may be primarily concerned with attention. The educator may be concerned with comprehension and recall. The politician may emphasize acceptance, while the recipe writer may worry about comprehension and use.

The typographic encoder typically works within—and frequently sharpens—these goals. In addition, he may have a set of goals of his own. They may be sub-goals related to the source's goal, such as the goal of creating novelty which in turn will attract attention. Or, they may be independent goals; the typographer may be interested in creating an aesthetic experience, while the original source didn't care.

These sub-goals can, of course, conflict with goals of the encoding team. If, in a film, for instance, we are led to remark, "My, what lovely music," it probably means that the musicians have overdone their bit. If we become conscious of the music as a separate entity, it is probably not integrated into the whole in the way that it should be.

Usually, the communication goals are so inter-related that manipulating one influences the others. We can increase attention, for instance, by introducing novelty. However, at least certain kinds of novelty may work against comprehension. We may have to weigh the potential gains in attention against the potential loss in comprehension.

The typographer works very directly to reduce the types of receiver uncertainty outlined earlier. In addition to these receiver constraints, he probably has to work within constraints imposed by resources, the amount of time available, the channel to be used, and decisions made by other members of the encoding team.

Implications for Typographic Research

Given this laborious recasting of the familiar into an abstract and abstruse form, have we gained anything by our efforts? Hopefully, we have a clearer vision of what should be necessary for an emerging theory of typographic communication. We should have a more orderly array of research needs, and some criteria for arranging a hierarchy of research goals.

Some future theory of typographic communication, it is to be hoped, will be expressed in terms of high-level propositions that apply to the total communication system, incorporating the source, the typographic encoder, the message, the channel, and the receiver. Then we may expect propositions about the source and typographic encoder components and their interactions. Similarly, we could expect propositions about each of the other components and their interactions.

Within each component we will probably find additional variables that will influence each other and the effect of the component. We may expect, for instance, that research on metacommunication in other areas will illuminate that problem in typographic communication. Conversely, typographic research may be an efficient way to throw light on the broader problem of metacommunication.

In relating theories of typographic communication to broader communication theory, we will probably be faced with questions such as: In predicting the outcomes for a communication system, how much of the variance is accounted for by typographic decisions?

This, in turn, may vary as we control additional factors. We may hypothesize, for instance: As the receiver perceives competing content to be increasingly equal in value, typographic factors will increase in importance. If we find that typographic decisions account for a large amount of the variance under specified conditions, we may hypothesize: As encoder investment (in time, energy and resources) increases, decoder selection increases.

While we can frame long-range questions of theory, immediate research, of course, must build with today's methodology on the footings raised by earlier theory and research. Fortunately, several significant probes have already been made by researchers such as C. Burt (3), M. A. Tinker (12), J. B. Haskins (7), M. E. Wrolstad (14), R. Martin (8), and P. H. Tannenbaum, et al. (11).

Beside these direct probes, typograhic research should be able to feed

on theorizing in related areas. P. H. Tannenbaum (10), for instance, has discussed what he calls the "indexing process," which seems to bear on typographic questions as well. J. L. Fischer (4) has suggested that the use of space in pictorial matter reflects deep cultural patterns which should be understood by encoders. E. T. Hall (5) (6), of course, has made extensive explorations into the use of space as a communication code. And J. Ruesch and W. Kees (9) suggest an approach to nonverbal communication which subsumes typographic factors under "object language."

In summary, we have attempted to sketch typographic research within the broader picture of scientific theory-building. We have recast a few familiar aspects of typographic decision-making into the more abstract framework of communication encoding. Briefly reviewing existing research and related theorizing, it appears that much good spade-work has already been done, but the building of a coherent theory has just begun.

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Readability of Typewritten Material: Proportional Versus Standard Spacing

Donald E. Payne

To what extent do differences in the spacing and width of characters affect the readability of typewritten materials? Reading speed and comprehension scores were compared in two studies; an original experiment and a subsequent replication. Test material consisted of several passages taken from the Davis Reading Test and typed in two versions—one set with proportional spacing (IBM Modern) and the other with standard spacing (IBM Prestige Elite). Results showed a significant difference in reading speed in favor of proportional spacing, without loss in comprehension. There was also evidence of an interaction between passage-difficulty and character spacing, which suggests that reading speed measures may underestimate real differences in readability if comparisons are based solely on simple or familiar material.

Typewritten materials account for a substantial share of the written communications in contemporary society. This would include, for instance, virtually all formal correspondence, most reports (including many of those which may at some later date find their way into print), business and government contracts, proposals, etc. Despite the importance of typewritten materials, a review of the literature failed to uncover published studies which could provide a direct answer to the question: To what extent do differences in the spacing and width of typewritten characters affect the readability of typewritten materials? Consequently, a research project was designed to try to find some answers.[1]

There has, of course, been a substantial volume of research on typog-

[1] Financial support of this research was provided by the Office Products Division, International Business Machines Corporation. I am grateful to the Psychological Corporation for permission to reproduce portions of the Davis Reading Test for the purpose of this research. I also wish to express my appreciation to Peter Golding for his invaluable assistance in collecting and analysing the data for this research.

raphy. Much of the research has been concerned with the *legibility* (i.e., ease with which one letter or numeral can be distinguished from others) of different typeface styles and different proportions of height, width, and stroke-thickness.[2] A smaller share of the research has been devoted to studies of the *readability* (i.e., ease of recognition of groups of letters forming words, phrases, and sentences) of various typefaces.[3] The remainder of the research has been concerned with specialized problems, such as the design of alphanumeric characters of high "visibility" for aircraft and radar displays,[4] or the selection of typefaces which are esthetically pleasing or which seem "appropriate" for different types of editorial material.[5]

The reported research, however, has compared typefaces commonly used in printing, and not typefaces commonly used in typewriters. The present study was designed specifically to investigate differences in readability between two typewriter typefaces, both produced by International Business Machines Corporation: (1) Prestige Elite, a standard typewriter face with all characters designed to one basic width; and (2) Modern, a proportionally-spaced typewriter face with characters designed to four different widths. Samples of typed material for each are shown in Figures 1 and 2.

The individual characters in each of the two typefaces are identical in height; they differ in letter-width, letter-spacing, and word-spacing. It should also be noted that the two faces have been designed for different line spacing. Prestige Elite has a line depth of 12 points; Modern, a line depth of 14 points. These differences constitute what IBM refers to as proportional spacing.

In the experimental design, the independent variable was represented

[2] A useful source of references: "Legibility of Alphanumeric Characters and Other Symbols: I. A Permuted Title Index and Bibliography," U.S. Department of Commerce, National Bureau of Standards, Miscellaneous Publication 262–1. Washington: Superintendent of Documents, U.S. Government Printing Office, 1964.

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[4] The special alphanumeric characters devised for high visibility, such as NAMEL, Berger Numerals, Lansdell Numerals, Mackworth Numerals, etc., have little relevance to reading. Research and examples can be found in McCormick, E. J. *Human Factors Engineering.* New York: McGraw-Hill, 1964; Chapter 6. "Information Displays."

[5] Zachrisson, B. *Studies in the Legibility of Printed Text.* Stockholm: Almqvist & Wiksell, 1965; especially Chapter 3, " 'Congeniality' of Types and Typography."

by proportional and standard spacing. The dependent variable, readability, was measured by reading speed and comprehension.

STUDY I

Method

A total of 190 men and women were tested, using four passages of typewritten material. The passages consisted of four excerpts from the Davis Reading Test.[6] Each passage was followed by a series of multiple-choice questions to test comprehension of the material.

The passages were selected to provide variety of topics at a level of difficulty which was judged to approximate that of various types of business communications. That is, the sample included material similar to that which might be found in technical reports, descriptions of company procedures, and routine correspondence.

Each passage and each series of questions was typed on a separate page. Two versions were typed—one set with proportional spacing (Modern) and the other with standard spacing (Prestige Elite). Sample pages were printed and carefully matched for quality and blackness of impression. The two sets were identical in format, i.e., same number of words per line, same number of lines, same hyphenation for broken words at the end of a line, etc. In other words, except for the inherent differences between proportional and standard spacing, the two sets of material were exact duplicates.

Testing Apparatus

The A.M.O. apparatus (Appareil à Mesure d'Observation) is a device resembling a large loose-leaf, spiral-bound book. As the pages of the book are turned, a set of stopwatches mounted in the back of the book are actuated by a mechanical linkage. These stopwatches record, to the nearest tenth of a second, the length of time a page is exposed to the reader's view.[7]

The four typed passages were inserted in pages of the A.M.O. appa-

[6] The specific passages were: "Finland" (346 words Form 1-A, 8 questions), "Marston" (324 words, Form 1-C, 6 questions), "Sponges" (368 words, Form 1-B, 7 questions), and "Economics" (228 words, Form 1-C, 6 questions). Passages are untitled in test. Titles listed are merely for identification.

[7] The A.M.O. apparatus was originally developed by Marplan, France.

A study has been made by a group of economists of the impact of federal, state, and local taxes on the individual family, including not only income taxes but all others, from sales taxes and customs to the corporation profits tax. It shows that our tax structure is not nearly so progressive as has been claimed. (A progressive tax is one in which the rate goes up as the income increases; a regressive tax, on the other hand, takes a larger proportion of the income of poor families than of rich families.)

These are the conclusions:

1) The lowest income group -- those families earning up to $2,000 per year -- pay 27% of their income in taxes; the highest income group -- those earning more than $10,000 -- pay 41% in taxes.
2) The federal taxes alone are slightly more progressive -- ranging from 16% to 33% for these two groups -- but state and local taxes are actually regressive.
3) Despite the progressive federal income tax, the average family earning $3,000 pays almost as large a portion of its income in taxes (all taxes) as the family earning $10,000: 28% versus 32%.

The analysis did not support the oftmade assertion that the present tax rates harm investment. On the contrary, the large investor is probably the chief beneficiary of preferential tax treatment.

Figure 1. One of the passages ("Economics") used in both Study I and Study II—composed in IBM Modern, a proportionally-spaced typewriter face with characters designed to four different character widths.

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Figure 2. The same passage as Figure 1—composed in IBM Prestige Elite, a standard typewriter face with all characters designed to one basic width.

ratus. The subjects were told that the purpose of the experiment was to measure the difficulty level of a series of passages for an adult reading test. Each individual who participated in the experiment was instructed to open the book to the first passage, read it as he ordinarily would if he came across it in a magazine, then turn the page and answer the multiple-choice questions about the passage. He was further instructed not to turn back to the passage at any time (if this were done, the stopwatch would be actuated again). The experimenter remained in the room observing the experimental subjects to discourage deviation from the desired procedure. In those few cases where subjects failed to follow procedure, their results were excluded and new subjects were recruited. The length of time that each passage was exposed to the view of the subject was recorded. This time record, together with the answers to the multiple-choice questions for each passage comprised the basic data of reading speed and comprehension.

Because the number of words per passage varied, the elapsed time of exposure for each passage was divided into the number of words per passage to produce the reading speed score: *Words-per-minute.*

Comprehension was measured for each passage by dividing the number of questions correctly answered by the total number of questions for that passage to produce the reading comprehension score: *Percent correct.*

Experimental Controls

Individuals differ in reading skill. Consequently, the experiment was designed so that each individual would, in effect, serve as his own control. That is, each individual would read two passages typed with proportional spacing (P) and two typed with standard spacing (S). This in turn meant that two series of passages had to be used, as follows:

Series A		*Series B*	
Finland	(P)	Finland	(S)
Marston	(S)	Marston	(P)
Sponges	(P)	Sponges	(S)
Economics	(S)	Economics	(P)

Subjects

The sample of subjects for this experiment consisted of 190 men and women recruited from passers-by in a shopping center. Recruiting was

limited to adults who were employed full time. The recruiting procedure was intended to produce a sample of adults which could be expected to be reasonably heterogeneous with respect to common demographic variables. The demographic characteristics of the sample are shown in Table I.

TABLE I. *Demographic Characteristics of Sample: Study I*

Characteristic	*Men*	*Women*	*Total*	*Characteristic*	*Men*	*Women*	*Total*
Age				*Income*			
21 to 25 years	44	65	109	Under $5,000	6	11	17
26 to 35 years	25	7	32	$5,000 to $9,999	41	31	72
36 to 45 years	15	13	28	$10,000 to $14,999	34	30	64
46 to 55 years	9	9	18	$15,000 to $19,999	9	13	22
56 years and older	2	1	3	$20,000 or more	3	9	12
				Refused	2	1	3
Education				*Occupation*			
Completed high school	25	52	77	Clerical	14	44	58
Some college	28	14	42	Sales	18	12	30
College graduate	31	11	42	Teacher	7	17	24
Graduate or professional	10	7	17	Engineer	12	1	13
Other/Refused	1	11	12	Manager	4	2	6
				Professional	18	9	27
				Other	22	9	31
				Housewife	—	1	1

Results

Mean scores for reading speed and comprehension are shown in Table II. The figures presented in the table reveal small differences in favor of proportional over standard spacing, which did not achieve statistical significance.

TABLE II. *Mean Reading Speed and Comprehension Scores: Study I*

Measure	*Proportional Spacing*	*Standard Spacing*	*t*	*p*
Reading Speed (Words per minute)	185	179	1.67	.10
Comprehension (Percent correct)	43	40	1.67	.10

Note: Significance of differences was computed using the formula for difference of correlated means (Walker and Lev, 1953). A two-tailed test was used.

Mean scores for reading speed and comprehension for "hard" and "easy" passages are shown in Table III. The "hard" passages ("Sponges" and "Economics") were more complex, technical selections; the "easy" passages ("Finland" and "Marston") were simpler, essentially narrative and descriptive selections. None of the differences was statistically significant.

TABLE III. *Mean Reading Speed and Comprehension Scores for Hard and Easy Passages: Study I*

	Reading Speed		*Reading Comprehension*	
Passage	*Proportional Spacing*	*Standard Spacing*	*Proportional Spacing*	*Standard Spacing*
	(Words per minute)		(Percent correct)	
Hard	164	162	43	40
Easy	171	158	42	41

Discussion

Although the observed differences did not achieve statistical significance, the direction of the differences favored proportional spacing. Moreover, the passages in which proportional spacing appeared to increase speed of reading were those in which there was the least difference in comprehension; whereas when proportional spacing made the least difference in speed, there appeared to be a slight gain in comprehension.

Although the numerical differences obtained were rather slight, their pattern thus suggested that the difficulty level of the materials may differentially affect the outcome of the comparisons. The results of this study showed a considerable amount of overlap between performance on the hard and easy passages. Evidently the "hard" passages were not really a great deal harder than the "easy" ones. Since it was not possible to determine from this whether the easy passages had been too hard or whether the hard passages had been too easy, it seemed desirable to replicate the study using a broader range of difficulty from "very easy" to "very hard" passages. To accommodate this expanded range it was decided to increase the number of paragraphs from four to six. The results of the replication are reported in Study II.

STUDY II

Method

The procedures employed in Study II were essentially identical to those

from Study I. However, because of the inclusion of a larger number of passages, it was necessary to use a somewhat more complicated order of presentation.

The passages consisted of six excerpts from the Davis Reading Test.[8] Six orders of presentation were used. These orders were arranged so that each passage appeared in each possible position (i.e., first, second, third, etc.) at least once. Within each order of presentation, half the passages were typed with proportional spacing and half with standard spacing, in counterbalanced order.

A total of 198 men and women were tested. As in Study I, the sampling procedure consisted of recruiting adult passers-by from a suburban shopping center. The demographic characteristics of the final sample are shown in Table IV.

TABLE IV. *Demographic Characteristics of Sample: Study II*

Characteristic	*Men*	*Women*	*Total*	*Characteristic*	*Men*	*Women*	*Total*
Age				*Income*			
21 to 25 years	27	46	73	Under $5,000	2	10	12
26 to 35 years	33	24	57	$5,000 to $9,999	35	30	65
36 to 45 years	19	19	38	$10,000 to $14,999	46	31	77
46 to 55 years	16	6	22	$15,000 to $19,999	11	13	24
56 years and older	4	3	7	$20,000 or more	6	4	10
Refused	1	—	1	Refused	—	10	10
Educational				*Occupation*			
High school graduate	20	36	56	Clerical	6	38	44
Some college	26	32	58	Sales	24	12	36
College graduate	32	17	49	Teacher	6	15	21
Graduate study	22	13	35	Engineer	19	—	19
				Manager	20	4	24
				Professional	23	21	44
				Refused	2	—	2
				Housewife	—	8	8

In both studies, the sampling procedures produced fairly heterogeneous groups of adult subjects. However, there were some significant differences in the demographic composition of the two samples. The

[8] In Study II, one of the easy passages ("Finland") and one of the hard passages ("Economics") from Study I were used again. Two passages were added which were judged to be even easier than "Finland"—"Waldo" (366 words, Form 2-B, 11 questions), and "Johnson" (253 words, Form 1-C, 7 questions). Two others were added which were judged to be even harder than "Economics"—"Clocks" (334 words, Form 2-A, 10 questions), and "Lacquer" (236 words, Form 1-C, 10 questions).

subjects in Study II were older (though a majority of the subjects in both studies were under 35 years of age), somewhat better educated, and more frequently employed in managerial, professional, and engineering occupations. The incomes of the subjects in Study II were not significantly different from those of the subjects in Study I.[9]

Results

Mean reading speed and comprehension scores are shown in Table V. Passages typed with proportional spacing were read significantly faster than passages typed with standard spacing. Overall there was a six percent advantage in reading speed for the proportionally spaced passages. Comprehension scores were not significantly different.

TABLE V. *Mean Reading Speed and Comprehension Scores: Study II*

Measure	*Proportional Spacing*	*Standard Spacing*	*t*	*p*
Reading Speed (Words per minute)	180	170	2.72	.01
Comprehension (Percent correct)	48	49	.14	—

Note: Significance of differences was computed using the formula for difference of correlated means (Walker and Lev, 1953). A two-tailed test was used.

Mean scores for reading speed and comprehension for "hard" and "easy" passages are shown in Table VI.

TABLE VI. *Mean Reading Speed and Comprehension Scores for Hard and Easy Passages: Study II*

	Reading Speed		*Comprehension*	
Passage	*Proportional Spacing*	*Standard Spacing*	*Proportional Spacing*	*Standard Spacing*
	(Words per minute)		(Percent correct)	
Hard	169	151	39	42
Easy	206	202	57	58

Although a specific probability value cannot be assigned to the observed differences, it is interesting to note, in contrast to the findings in Study I, that there was a greater difference in reading speed in favor of proportional spacing for the "hard" passages than for the "easy" pas-

[9] Demographic distributions were compared by means of a simple Chi-square test for independent samples.

sages. This suggests that proportional spacing increases the readability of "hard" material more than it increases the readability of "easy" material. The hypothesis seems plausible. It has been reported that readers adjust their speed to the difficulty of the material to be read.[10] When the individual is working on a reading test, it seems likely that he will read at the highest rate of speed which he can attain without sacrificing comprehension (knowing that he will have to answer questions about the material after reading it). If this reasoning is correct, then the effect of proportional spacing may be explained as follows:

(1) For difficult material, reading speed is slowed down to permit comprehension. Standard spacing exacts an additional delay because of less rapid recognition (i.e., slower recognition). Proportional spacing does not make the content of the material less difficult to understand, but does reduce recognition time. Consequently, reading speed can be increased without loss of comprehension.

(2) For easy material, comprehension is quite rapid. The words and phrases are familiar and simple. Therefore, recognition time may be quite short, and the advantage of proportional spacing correspondingly smaller than for difficult material.

This interpretation suggests certain predictions which could be tested empirically. For example, if recognition times were measured tachistoscopically for individual words which differ greatly in familiarity, then there should be little or no difference in recognition time for familiar words irrespective of whether they were typed with proportional spacing or standard spacing. However, there should be significant differences in recognition time for unfamiliar words—the unfamiliar words typed with proportional spacing should be recognized significantly faster than the same words typed with standard spacing.[11]

Discussion

The results of the research suggest some answers about the readability of typewritten material. They also raise some questions. In the first place, there was a significant advantage in reading speed for proportional over

[10] Smith, H., and Dechant, E. V. *Psychology in Teaching Reading.* Englewood Cliffs, N. J.: Prentice-Hall, 1961. Pp. 223–224.

[11] I am indebted to Dr. H. A. Schwartz of IBM for pointing out the possibility of testing the interpretation by means of a comparison of tachistoscopic recognition times.

standard spacing of typewritten material, without a loss in comprehension.

The findings also suggest an interaction between passage-difficulty and proportional-vs.-standard spacing, which should be taken into account in future comparative studies. For example, if one tests different character widths and spacing in terms of reading speed on passages which deal only with relatively simple, familiar material, the results may seriously underestimate the readability difference.

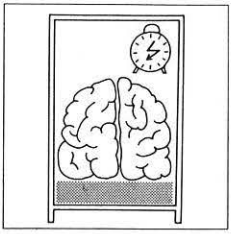
OCR-B: A Standardized Character for Optical Recognition

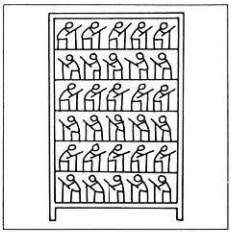
Adrian Frutiger
Collaborators: Nicole Delamarre and Andre Gürtler

OCR-B is a typefont especially developed as an international standard for optical recognition by electronic computers. It includes figures, upper- and lower-case letters, and certain related symbols. The background leading up to the development of OCR-B is discussed. Basically the problem was two-fold—to design a typefont (1) that could be automatically read by machines, and (2) that would be aesthetically accepted by the human eye. The design of OCR-B is examined in light of these requirements, and examples are shown.

The typefont presented here by Adrian Frutiger is the result of a standardization study to define a set of shapes which could be read accurately by electronic computers through optical reading equipment and which were not offensive to human taste. The definition of the typefont embodies compromises between the printing and reading requirements of many types of machines and the many typographical discriminations and habits of people in countries using a roman alphabet. Many opposing points of view were expressed within a design group which, as an engineer at Compagnie des Machines Bull, I brought together within the framework of the European Computer Manufacturers Association. Thanks to the enthusiastic collaboration of Adrian Frutiger, it was possible to reconcile his vast knowledge of typographic traditions and ruthless mathematical criteria.

The OCR-B font has been donated to public domain and now makes its own way along the careful paths laid down by ISO (International Organization for Standardization). Let us hope that it will soon replace many less decipherable predecessors on computer-made documents which have been part of our daily routine.—Gilbert Weill, Directeur de Programme au Centre National d'Etudes Spatiales, Paris

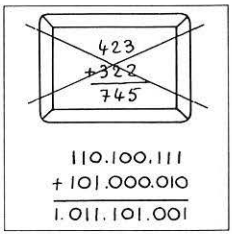




The Computer

Almost all human activities are now in some way related to the work of electronic computers. More and more, computers are the essential basis for the study of problems in scientific, economic, or sociological fields—even the problems of simple daily life.

Owing to their memory ability and their speed, these computers are able to perform the work of thousands of men. Within a few moments, hundreds of thousands of computing operations, comparisons, decisions, are made by the machine; whereas one hundred men equipped only with pencils would labor one hundred years to work out the same problems—and always with the possibility of error, taking into account the fallibility of the human brain.

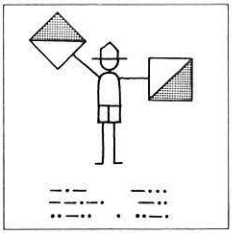


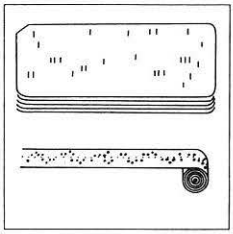
The Computer Cannot Read

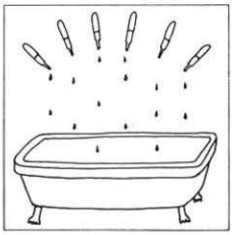
But the computer does not use the same language as men; it cannot work directly with figures and with our alphabet. It knows but two units: impulse and lack of impulse; it works with the binary system, i.e., every figure or letter is split up into two code signs.

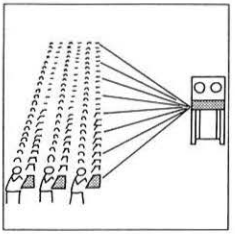
To represent data under coding forms is not new: the Morse code represents figures and letters by groups of dots and dashes, which are transmittable by two very simple movements.

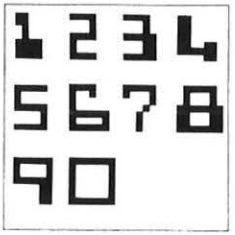
The computer communicates with our world in the same way a blind man reads in Braille: it scans a medium—punched tape or card, or magnetic tape—in order to find impulses in the form of holes or magnetic energy.

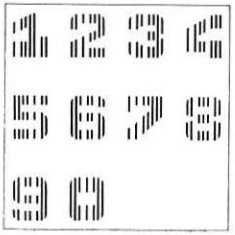


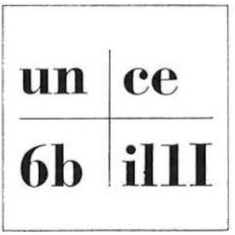












The Bottle-neck

Such tapes or cards are obtained by manual typing on a typewriter connected with a punching or magnetizing device. Every typed sign is converted into code. But the vast working abilities of the computer are inconsistent with the slowness of the human procedures necessary to change written data into code.

Many typists are then required to provide even a dropper-feeding of the computer; for within one hour a good typist can type only about 10,000 characters, when in the same time a computer is able to record ten million coded signs.

The Magnetic Characters

For many years electronics manufacturers, fully aware of this constraint, have been looking for a solution: automatic reading. Their research first led to the creation of specialized magnetic characters in which the code is directly incorporated into the image of the sign, that can then be read both by humans and by machines. Such systems have already led to automatization of banking procedures.

But using these characters demands that an excellent printing quality be maintained. Moreover, the distortions of our normal characters necessary for this system are almost unbearable to the human eye.

It Is Necessary to Have the Machine Read Our Writing

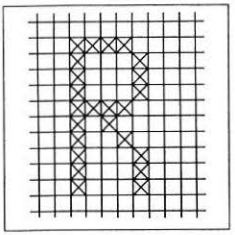
The setting up of reading devices able to identify automatically the configurations of our alphabet and to convert them into code becomes more and more essential. But we have to take into account the basic differences between the human and the machine reading processes; we do not read letter by letter, but by batches of syllables and words. Moreover, it is possible for our intelligence to deduce the meaning from the context. In fact, we quite naturally disregard similarities in the usual forms of letters. On the other hand, the computer reads only letter by letter and is unable to distinguish between such small differences of shapes as, for example, i, 1, l, and I.

Moreover, the quality of printing, which is poorest in typewritten material, is also to be taken into account; here is an enlargement of a typewritten figure 6, which shows important irregularities in lines.

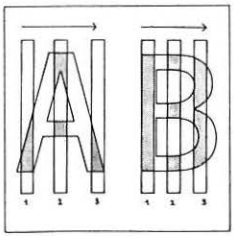
How

How is a computer able to differentiate the various shapes of letters, figures, and signs of our alphabet? Some illustrated explanations follow:

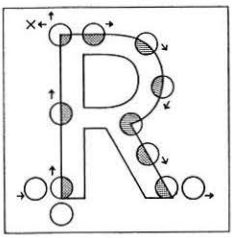
Key and Keyhole. Twenty-six keyholes corresponding to letter shapes are "programmed" in the reader. The letter which is read passes over the shapes, one by one, like a key searching for its corresponding hole. When it is inserted into the right opening, the code corresponding to the letter is found.



The Grid. A rectangle is divided into a certain number of small squares. All the letters must be inscribed inside this area. The shapes are conceived somewhat like the cross-stitch of our grandmothers' embroidery. In the reader, every small square is in fact a sensitive cell which records "dark" or "clear," that is, impulse or non-impulse. In this way the letter is coded.

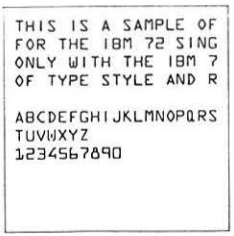


Automatic Reading System. In automatic reading the text is scanned by means of an elongated cell. If it recognizes, for example, that the left part of the letter about to be read is a complete stroke, it knows that this letter cannot be an A, but could be a B, not a C, but a D, or an E, or an F, etc. Scanning next the central part, then the right side, it is able to determine by process of elimination which letter is being read.



Another Automatic Reading System. Another way to identify the shape is to have its outlines explored by a cell programmed to search for the semi-darkness position—i.e., one half of the cell must always be clear, the other half dark. Thus, it automatically follows the outer edge of the letter and records the movements, which are then converted into code.

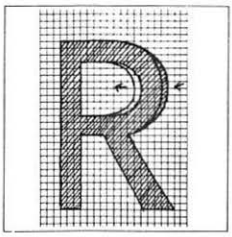
A Babel of Computer Languages Must Be Avoided
It is natural that every important computer manufacturer tends to develop his own optical reading method. But this leads to the danger that every company will create its own system of writing, corresponding to its reader requirements. For use at an international level confusion would be unavoidable, the machines of one manufacturer being unable to read the writings of the others.



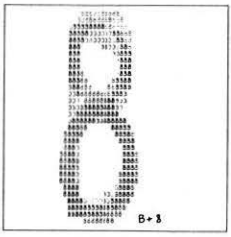
In the United States a special alphabet has been developed over the past several years in which the shapes of letters are strongly different from one another. The automatic reading of this alphabet is relatively easy, but such ease of recognition is to the detriment of the alphabet's appearance.

ECMA
The European Computer Manufacturers Association, conscious of the dangers of dispersal of methods, as well as of the neglect of the aesthetic and ethical aspect of the problem, has endeavored since 1963 to implement the full specifications for the creation of an optical reading alphabet including:
—a complete set of characters: figures, letters, signs, European accents;
—an optimum differentiation between every sign shape;
—an aesthetic appearance as close as possible to typographic characters.

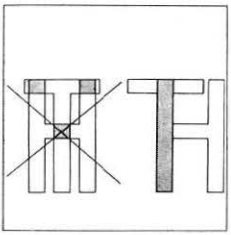
It was imperative to take into account *every* composition and printing process: fonts, typesetting and printing machines, typewriters, speed-printing machines, steel and plastic address plates, letterpress, offset, gravure, xerography, etc.



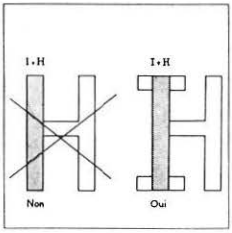
A Method
At the beginning the main problem was how to adapt a grid fine enough to be acceptable for all reading processes considered by every manufacturer and, at the same time, provide a screen fine enough to allow the design of harmonious shapes. On this ruled surface the development of the letterforms was carried out.



It was necessary to establish a method of measurement for comparison of shapes. The letter surface is punched in a card point by point. Then a computer compares every letter with all the others in the alphabet. It gives the results of the comparisons by superimposing the most critical groupings—for example, the 8 and the B shown here are easily discerned.



The comparison is carried out with a constant search for the most complete superimposition. For example, H and T are not compared with regard to their symmetrical positions but with regard to their largest common surfaces.

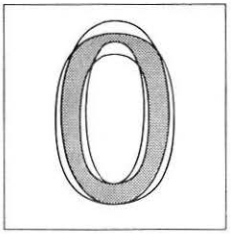


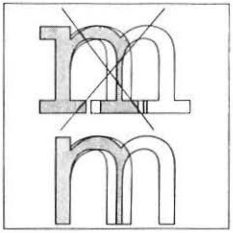
The Excessive Similarity of Our Letters

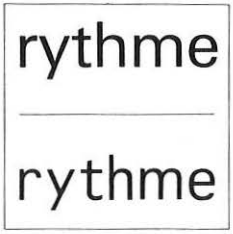
A character must never be fully included in another one; each must be differentiated by elements which are unique to it in comparison to the other one. For that reason, for example, it is imperative that the I should have serifs; in spite of opposition from the strictly typographic point of view, this is the only practical solution.

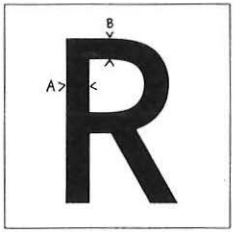
For the same reason, lower-case letters i, j, and l, capital I, figure 1, and the exclamation point have had to be more clearly differentiated than normally allowed by typographical use.

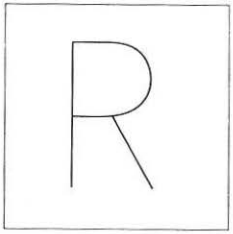
The greatest care must be exercised to distinguish clearly between certain figures and certain upper-case letters, chiefly between such symbols as 0 and 8 or B and S. In order to obtain that clear differentiation, it was decided from the beginning to decrease the height of upper-case letters in relation to figures and ascenders. This principle has also led to keeping all of the lower-case letters wide open and relatively extended, as well as simplifying placement of accents above upper-case letters.

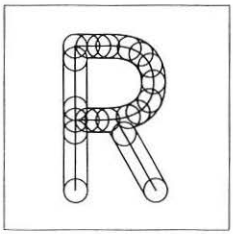












Why Sans Serif?

All these considerations have from the beginning eliminated the choice of a type face with serifs. The repeated presence of horizontal strokes would have considerably increased the letter likeness, uselessly creating minor shapes common to all letters.

A relatively large space between letters is imperative in order to avoid any confusion when a cell is reading. In fact, basic principles of good typography have been violated to some extent. This example shows, above, a normal representation of a word in type; and below, the same word in OCR-B; spaces between r, y, and t have become quite large.

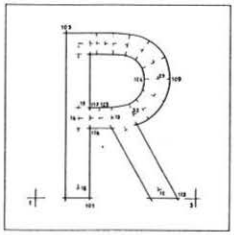
Stages of Elaboration

The first drawings were made in the traditional style. Curves are non-geometric and at the beginning are governed only by aesthetic laws. As far as possible, the drawing includes all the usual gradations of thickness between downstrokes (A) and upstrokes (B) (horizontal and vertical strokes), respecting the imposed thickness of minimum and maximum tolerances.

After testing final drawings of the traditional printers' shape, it was necessary to search for the centerline of all these non-geometric outlines. It is, in fact, this centerline which becomes the very basis, the skeleton, of all additional processes. It was, therefore, important to create first the printers' style, the most demanding from the aesthetic point of view, then to adapt it in a geometric way.

This design of the centerline automatically becomes the basic "blueprint" for typewriter font cutting. A drawing of an ideal enlargement of the typewriter font has been made around the skeleton lines (in a character called "sausage," with a constant stroke thickness).

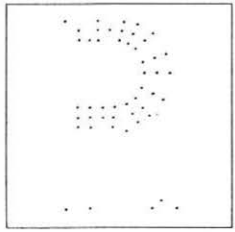
In order to meet the needs of various fields of application, the standardization of the alphabets in several sizes proved necessary. The enlargements were strictly proportional from the initial size, but with different multipliers for vertical and horizontal



6-39

CARACTERE R CHARACTER

N	Y1	X12	Y2
1	2000.	820.	2000.
2	1333.	2000.	1222.
3	2000.	3183.	2000.
101	2000.	1610.	2027.
102	2000.	1257.	2027.
103	4443.	1253.	4824.
104	4443.	1693.	4824.
105	4443.	1940.	4824.
106	4427.	2187.	4804.
107	4333.	2476.	4694.
108	4100.	2537.	4423.
109	3773.	2780.	4769.
110	3440.	2707.	3707.



measures. This "elongation" has been obtained as follows: along the outlines and centerlines of the printers' design, numbered measure points have been marked; every point refers to two measures: x = dimension measured from left vertical reference line; y = dimension measured from a horizontal base line.

A computer has calculated the new position for every point, and a pointing machine has set up reference points for the new size, from which it has been possible to establish the designs.

Trial Compositions

This composition specimen has been made in photocomposition, so that its appearance could be checked in actual composition. It is easily detected that widths of the different characters are variable. However, the exceptional width of the m, for which the maximal frame has been enlarged, is to be noticed; this letter is actually the most difficult one to condense without destroying the typographic appearance of the line.

Le principal goulot d'étranglement dans la suite des opérations de traitement réside dans l'obligation de préparer manuellement, à partir de documents conçus pour l'homme (états imprimés, fiches, registres) des documents directement exploitables par la machine, tels que des cartes perforées. Depuis de nombreuses années, les constructeurs de matériel électronique s'efforcent de

Here is also a first OCR-B cutting on the typewriter. Every letter is inscribed on the same width. Reading tests are to be made first of all with typed texts, representing a lower image quality than printed typography.

```
Les origines exactes de l'alphabet restent indistinctes.
Les caractères romains, qui sont à la base de notre al-
phabet actuel, s'apparentent aux caractères grecs lus,
à l'origine, alternativement de droite à gauche et de
gauche à droite.
```

The Reservoir

At present, testing on readers has been limited to the initial reservoir of forty-two characters, namely ten numerals, twenty-six upper-case letters, and six symbols. But a complete reservoir including a total of 111 characters has been designed in order to meet future needs. It would have been unthinkable to create an alphabet of upper-case letters without having determined the shape of a lower-case alphabet intended to go with it later on.

So that the typeface can be used in every country with a roman alphabet, nineteen characters and national signs have been added to the reservoir.

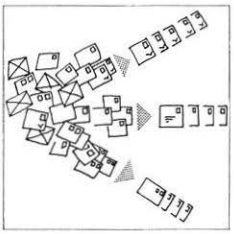
Standardization

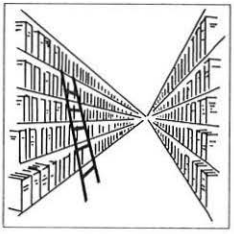
The whole of this work has been carried out with a view toward obtaining an international standardization for optical type. Under the name of OCR-B (Optical Character Recognition, class B) this new type has now become an international standard by which manufacturers are able to set up their reading machines.

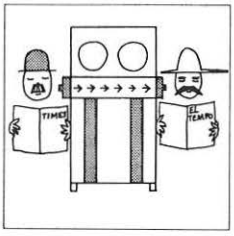
The Future

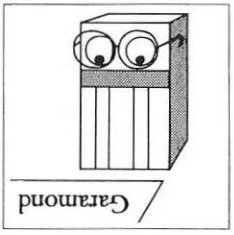
Automatic optical reading is likely to widen the bounds of the field of data processing. Let us cite as examples:

—Banks and insurance companies, which are already regular computer users, will have their task considerably simplified, owing to the standardization of one system for transcribing into code.









—Mail sorting, which poses more and more acute problems of time and manpower, can be done by automatic readers.
—Libraries can be consulted, and documentation, analysis, and selection made directly by the reading machine, without any limit of bulk, material, or time.
—Language processing and automatic translation can be carried out without manual transcription, whatever the geographic distance.

The creation of an optically legible type is an important step toward international co-operation in data processing. It may also be considered a success on a humane level; a new style of letters has not been created by the machine, but man tries to have the machine read the shapes which he created by long and difficult elaboration through centuries—from Egyptian stone-carving, through feather on parchment and the engraver's tool to the graphic artist, typographer, and printer in our time.

The future is still more encouraging in this respect: OCR-B will probably be but an intermediate stage. We can hope that one day "reading machines" will have reached perfection and will be able to distinguish without any error the symbols of our alphabets, in whatever style they may be written.

An Investigation of Visual Discrimination Training for Beginning Readers

Warren H. Wheelock and Nicholas J. Silvaroli

The act of learning to read is an associative-conceptual process. The formation of correct associations between the spoken symbol and the written symbol depends on the child's ability to make auditory and visual discriminations. This study concerned itself solely with the one factor of visual discrimination. It attempted to determine if those kindergarten students who are trained to make instant responses of recognition to the capital letters of the alphabet show a significant difference in their visual discrimination ability from those kindergarten students who did not receive this training. In analyzing the data, analysis of co-variance was used. Results showed there was significant difference (.01 level of confidence) in visual discrimination ability between students taught to make instant responses of recognition to the capital letters of the alphabet and those who did not receive this training. It might be assumed that learning to make these responses enhances visual discrimination ability.

The act of learning to read is an associative-conceptual process. The formation of correct associations between the spoken symbol and the written symbol depends on the child's ability to make auditory and visual discriminations as well as upon the general wealth of his experience with the word in its various meanings. From among the many factors that contribute to readiness for beginning reading, this study concerned itself solely with the one factor of visual discrimination.

All of the word forms printed in English are but combinations of only 26 different letters. Learning to see visual differences and similarities among word forms appears to be a formidable task for any child. The word forms "EAT" and "FAT" may be confusing to the beginning reader because these words may look alike, and it may also be due to his inability to distinguish upper case "E" and upper case "F." The implication of this for teaching may be that it is essential to beginning reading that pupils have already developed an ability to distinguish the

graphic shapes of the letters, as can be shown by instant responses of recognition.

It is believed that the development of the habits of instant responses to the significant contrastive features of the capital letters of the alphabet will relieve some of the burden placed upon the beginning reader by the associative practice that introduces word forms and word meanings or letter forms and letter sounds during initial reading instruction, and thereby might better prepare the child for initial reading instruction.

In most American elementary schools today the current reading readiness programs seem to be aware of the importance of perception, and to emphasize the need for the child to make visual discriminations and auditory discriminations, and to learn letter and word orientations. An examination of several representative basic readiness programs reveals that these programs devote some of the readiness time in training the child to make visual discriminations.

However, the preponderance of this perceptual training has to do with learning to discriminate pictorial forms and geometric shapes from one another. Gates found only low correlations between discrimination of geometrical figures and reading ability.[1] Vernon is of the opinion that learning to discriminate meaningless shapes from one another does not have much effect on learning to recognize letters and words.[2]

According to some workers, individual letters constitute the most important cues in word perception.[3] Durrell's study of success in first grade reading leads him to summarize that "without perception of letter forms, there is little hope for reading success."[4] Capital letters, according to Fries, have the simplest forms and thus furnish the most efficient materials for learning the process of reading at the very beginning.[5]

[1] Gates, A. I., "A Study of the Role of Visual Perception, Intelligence and Certain Associative Processes in Reading and Spelling," *Journal of Educational Psychology,* 17:430–439, 1926.

[2] Vernon, M. D., "The Perceptual Process in Reading," *The Reading Teacher,* 13:2–8, October, 1959.

[3] Anderson, Irving H., and Walter F. Dearborn. *The Psychology of Teaching Reading.* New York: The Ronald Press Company, 1952.

[4] Durrell, Donald D., and others, "Success in First Grade Reading," *Journal of Education,* 140:1–48, February, 1958.

[5] Fries, Charles C., *Linguistics and Reading.* New York: Holt, Rinehart and Winston, Inc., 1962.

Gibson seems to be in agreement with Fries on this point, for she indicated that the simplest form of the letter would eliminate "noise" from the stimulus, thereby facilitating the perceptual task in children.[6]

Anderson and Dearborn also feel that capital letters have "cue value" because they attract notice on account of their size.[7] The high (ascending) and low (descending) letters, together with the capitals, were called "dominant letters" by Zeitler.[8] In experiments with a tachistoscope, he obtained many instances of misreading in which the capital letters were reported correctly. Hence he concluded that these letters must have dominated or controlled the student's perception of the word.

The repudiation of the old "alphabet method" of teaching reading has given rise to a variety of unfavorable attitudes toward the alphabet itself. These attitudes have tended to persist and thereby rule out the introduction of those activities related to the training of letter forms. The Letter-Form-Training Program suggested in this study did not endeavor to teach the names or sounds of the letters or the association of these sounds and letters; instead, this study did endeavor to train the child to make instant responses of recognition to the capital letters of our English alphabet.

Purpose of the Investigation

The major aspects of the problem of this study were: (1) Will those kindergarten students who are trained to make instant responses of recognition to the capital letters of the alphabet show a significant difference in their visual discrimination ability from those kindergarten students who did not receive this training? (2) To what extent can instant responses of recognition to the capital letters of the alphabet be trained during the "readiness stage" of, and prior to, formal instruction in reading?

Methods and Procedures

Prior to the opening of school in September, 1964, three schools in the

[6] Gibson, Eleanor J., "Perceptual Development," *Child Psychology: The Sixty-Second Yearbook of the National Society for the Study of Education.* Chicago: The University of Chicago Press, 1963, pp. 144–195.

[7] Op. cit.

[8] Zeitler, Julius. "Tachistoskopische Untersuchungen uber das Lesen," *Philosophische Studien,* 26:380–463, 1900.

Phoenix Elementary School District Number One, Phoenix, Arizona, were selected to participate in this study. The three schools selected represented extremes in a socio-economic continuum within the district. An attempt was made to establish the fact, based on the available census data, that the children in this study were representative of two different environments within this school district. It was realized that the term "high socio-economic group," as used in this study, would not hold once it was removed from the context of the Phoenix Elementary School District Number One. The same would apply to the term "low socio-economic group," as we used it.

All of the children attending the morning kindergartens in these schools were administered visual discrimination sub-tests one, two, and four of the Lee-Clark Reading Readiness Test, and a Letter-Form-Training Criterion Test.

The three visual discrimination sub-tests of the Lee-Clark Reading Readiness Test were administered to the children in small groups of not more than ten in each group.

The Letter-Form-Training Criterion Test (L-F-T Test) was designed by the writers to measure the child's ability to make instant responses of recognition to the capital letters of our English alphabet. The test material is presented on a film strip (Figure 1). The film strip consists of two practice frames and 26 frames of actual test items. Each test item represents one letter of the alphabet flashed by means of a tachistoscopic device for approximately 1/40 of a second. The child is required to recognize instantly the stimulus letter and then pick out that letter from four letters displayed on a card.

For example, the letter "H" is flashed and the respondent must pick that same letter out of the letters "F, H, E, A." The practice frames show the child where to look and how he is to respond, and allows time to become acquainted with a tachistoscopic presentation.

All of the children were given the Letter-Form-Training Criterion Test on an individual basis. It was administered as a control on prior ability to perform the task of instant responses of recognition.

A random selection was made from an alphabetical list of these 98 kindergarten children to determine the experimental and control groups. Transfers and illness resulted in a final sample population of 90 children. Forty-five were placed in the experimental group, and 45 in the control group.

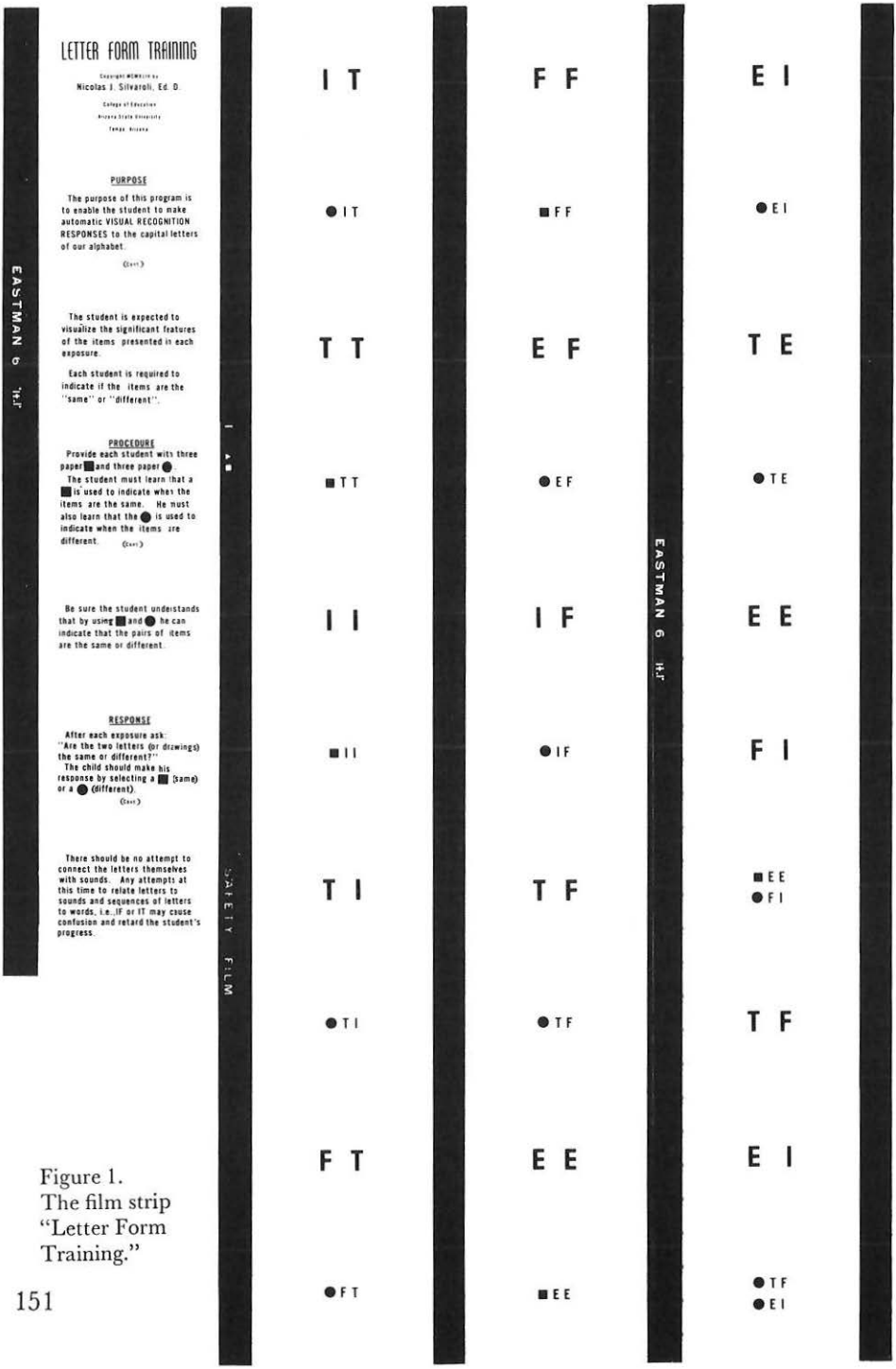


Figure 1.
The film strip
"Letter Form
Training."

The children in the experimental group were given training to establish instant responses of recognition to the capital letters of our English alphabet, in addition to their regular kindergarten activities.

The training of instant responses of recognition to the capital letters of our English alphabet was attempted by means of a series of five film strips which introduced 16 upper-case, sans-serif capital letters. The eight stick letters introduced were: "I, T, F, E, H, A, M, N." The four stick and circle letters introduced were: "D, B, P, R." The four circle letters introduced were: "U, O, C, S."

The experimental group received 15 minutes of training a day, five days a week, for a period of one month. These training procedures are described below.

The purpose of this series of training film strips was to enable the student to make visual recognition responses to the capital letters of the alphabet. The child was expected to visualize the significant features of the contrasting letters presented in each exposure. Each student was required to indicate if the contrasting letters were the "same" or "different." To do this each student was provided with three cardboard squares and three cardboard circles. The child was then taught that a square represents contrasting letters which are the same, and that the circle represents contrasting letters which are different.

The first film strip used introduced the stick letters, "I, T, F, E," in 30 combinations of contrasting letter pairs. The contrasting letter pair "E, F" was flashed. Since the children were taught that a response to "different" calls for a circle, they were expected to display one circle on the table before them. The second frame was then exposed and held on the screen, showing the "E, F" preceded by a circle. The children could then compare their response to the standard shown on the screen. Those that had correctly displayed a circle were reinforced by the standard on the screen, and those that had displayed a square were helped to see that the "E, F" were "different" and that a circle was used to respond when two things were "different." The same procedure was followed when a contrasting letter pair that was the "same" was flashed, e.g., "E, E."

All of the film strips were shown using a standard film strip projector with a tachistoscopic attachment for use when flashing was called for. For each frame of contrasting letter pairs shown, the instructor called the children's attention to the significant contrastive features of the

letters. This was done after the children had first responded to them by use of their squares and circles.

At the conclusion of this training all of the children in both groups were again administered sub-tests one, two, and four of the Lee-Clark Reading Readiness Test, and the Letter-Form-Training Criterion Test. Exactly the same procedures were followed as those described in the pre-testing.

In analyzing the data, it was decided to employ the statistical technique of analysis of covariance to provide the investigator with a measure of attaining control of individual differences when testing for significance.

Results

To control on individual differences in aptitude and ability which might have had an unbalanced influence on the mean criterion of the groups of students trained by the different methods, sub-tests one, two, and four of the Lee-Clark Reading Readiness Test were administered during the first month of the 1964–1965 school year. As was noted earlier, the sample population for this study was comprised of kindergarten children representing extremes of the socio-economic continuum within the Phoenix Elementary School District Number One. Since these children were tested at the outset of their first school experience, it was assumed that the Lee-Clark would be a valid measure of the child's ability to make visual discriminations prior to any formal training in school.

TABLE 1: *Analysis of Variance of the Visual Discrimination Sub-tests 1, 2, and 4 of the Lee-Clark Reading Readiness Test for Children, Representing Extremes of the Socio-economic Continuum within the Phoenix Elementary School District #1*

Source of Variation	*Degrees of Freedom*	*Sum of Squares*	*Mean Square*	*F Value*
Socio-economic Status	1	1,449	1,449	12.5
Within Subgroups	96	11,148	116	
Total	97	12,597		

$F_{1, 96} = \frac{1,449}{116} = 12.5$. It should be noted that while only 90 children remained in the groups at the termination of this study, 98 children were available at the time of the pre-testing.

The additional fact that there was significant difference in visual discrimination ability between students taught to make instant responses of recognition to the capital letters of the alphabet and those who did not receive this training, might lead to the assumption that learning to make these responses enhances visual discrimination ability.

There are, however, certain limitations to be considered. While learning to make instant responses of recognition to the capital letters of the alphabet, the children were learning to attend to these stimuli and to concentrate on them. The attention-concentration factor is one that merits consideration. In order to make visual discriminations, one must attend to things being discriminated.

While the pre-test results very definitely favored those children who came from environments characterizing the upper extreme of the socio-economic continuum within the district, the children from the lower extreme of the same continuum seemed to profit most from the training. Perhaps further investigation will find that children who do well on tests of visual discrimination ability upon entry to school will progress satisfactorily within the scope of the usual readiness programs, and that those children who do not already possess the ability to a satisfactory degree will profit most from this kind of additional training. The results of this study tend to point in that direction.

Typographic Research and Bibliography

G. Thomas Tanselle

The relationships between typographic research and bibliography can be surveyed by looking at four principal categories of material: (1) histories of typefounding and of type designs—such as Rollo Silver's *Typefounding in America, 1787–1825* (1965) and Carter and Vervliet's *Civilité Types* (1966); (2) histories of printing and of publishing—such as D. F. McKenzie's *The Cambridge University Press 1696–1712* (1966); (3) descriptive bibliographies—also represented by McKenzie's work; and (4) works of bibliographical analysis—such as Robert Turner's articles on the bibliographical uses of type-damage evidence. These few recent examples of the uses of typographic research in bibliography can serve to illustrate the ultimate interdependence of all studies of printed letter-forms.

If bibliography is taken to mean the study of all aspects of the book and its production, then any kind of research into typography would be of concern to the bibliographer. It is more common, however, to define bibliography as the *historical* study of the book; and a "bibliographer," therefore, finds that not all the activities which can be classified as "typographic research" are equally significant for his purposes.

While a person whose research involves the development of computer-generated type faces, for example, will benefit from knowing the evolution of the forms he is working with, and while the bibliographer will be aided in the reconstruction of earlier technical processes by observing current ones, each is focusing his attention on a different area. Studies of the legibility of various type designs and layouts or investigations of their psychological effects and their relation to the learning process, under normal circumstances, are of no concern to the bibliographer, although one cannot deny that such research might yield some data for a broad historical study of the book trade and popular reading habits, however little it has been used for this purpose in the past. At the same time, only bibliographers are interested in the analysis of broken types as an aid to a

detailed accounting of the printing history of a particular book, for such emphasis is not on the regular features of a given type design but on accidental variations in individual pieces of type.

To survey the relationships between bibliography and the whole spectrum of typographic research involves looking both at the bibliographical end of that spectrum and at the middle part in which various interests overlap. Moving from the middle toward the end, one finds four principal categories of material: (1) histories of typefounding and of type designs; (2) histories of printing and of publishing; (3) descriptive bibliographies; and (4) works of bibliographical analysis. Each of these is represented by one or more relatively recent books; a glance at these books, with perhaps some side-glances at a few of their predecessors, may serve to characterize the whole field.

Histories of typefounding and of type designs, aside from their importance as contributions to economic and cultural history, provide the bibliographer with knowledge essential for dating and identifying the work of particular printers. Probably the major bibliographical activity of the nineteenth and early twentieth centuries—manifested in the work of such men as Proctor and Haebler—was the analysis and classification of the type faces in incunabula, in an attempt to assign these books to the proper locations and printers; and the discovery of Thomas J. Wise's forgeries through an analysis of type designs illustrates the bibliographical importance, even for more recent books, of an acquaintance with typographic history. Any bibliographer, in other words, must know such basic general accounts as Stanley Morison's *On Type Designs* (1926, 1962), A. F. Johnson's *Type Designs* (1934, 1959), and D. B. Updike's *Printing Types* (2 vols., 1922); and he must then turn to whatever specialized studies of particular designs or traditions exist for the period with which he is concerned. A well-known instance of this sort is Horace Hart's work on the Fell types during his years at the Oxford Press—or, among the new books, Harry Carter and H. D. L. Vervliet's *Civilité Types* (Oxford Bibliographical Society, n.s. XIV, 1966).

Carter and Vervliet, in this admirably presented study, provide a thirty-page, well-illustrated historical sketch of the use of civilité types ("types rendering a cursive hand of the sixteenth century in a calligraphic form"). The rest of their book is given to detailed descriptions of each of the types, and histories of the punches and matrices for each,

with illustrations displaying the characters. The arrangement of the book is convenient for reference: the discussions of individual designs are grouped by punch-cutter (assigned a letter designation), and numbers are assigned to each type (B1 and B5, for example, are two types by Philippe Danfrie). The very useful tables, listing the types chronologically and by size (pp. 88–89), can then cite these "Carter-Vervliet numbers." An appendix lists 636 books—printed between 1557 and 1874—which make use of civilité types, indicating with these reference numbers the types found in each (and the comprehensive index covers not only the text but all the names of authors and printers in this list). The work is an excellent illustration of one kind of typographic research that is of great usefulness to bibliographers, for the volume will clearly be indispensable to any bibliographer who is faced with examining a book in which these types appear.

Since not many individual designers or particular styles of type have been given such thorough treatment, bibliographers must often turn to specimens of founders themselves in order to identify certain types. The basic guides to this area are the checklists of known specimens—notably W. T. Berry and A. F. Johnson's *Catalogue of Specimens of Printing Types by English and Scottish Printers and Founders, 1650–1830* (1934) and the list of pre-1800 specimens (by Harry Carter, *et al.*) in the *Library*, 4th series, XXII (1941–42), 185–204. Because early specimen sheets are very scarce, the series of *Type Specimen Facsimiles* (1963–), edited by John Dreyfus with a comprehensive introduction by Stanley Morison, is performing a valuable service on a grand scale. And the Bibliographical Society has produced standard encyclopedias of all the type faces in use at a particular place and time—such as Gordon Duff's *Early English Printing* (1896) or Frank Isaac's *English Printers' Types of the Sixteenth Century* (1936).

Little scholarly attention has been paid to American typefounding, though Ralph Green prepared a list of American specimens (1951) and Carl P. Rollins edited *The Specimen Books of Binny & Ronaldson, 1809–1812* (1936). But Rollo G. Silver, in another of the new books, puts all students of the American book and printing trades even further in his debt. His *Typefounding in America, 1787–1825* (Charlottesville: University Press of Virginia, 1965) is a pioneer work which makes at least two important contributions: it furnishes a new chapter in American economic and industrial history, and it provides reproductions

from a generous number of American specimens of the period. It combines the functions of narrative history (with chapters on "Inventions and Patents" and "The Importation of Type") and composite specimen book (with nine plates from Binny & Ronaldson and James Ronaldson specimens, for example, and eleven from D. & G. Bruce and George Bruce). If, as Silver says, there is much work yet to be done in identifying the occurrences of these types in specific books, his own research provides the essential tool with which to begin.

The second category of material—histories of printing and publishing—is less directly concerned with typography, but it is inevitable that most historical accounts of printing and many of publishing will include some discussion of typographic matters. Books like P. M. Handover's *Printing in London* (1960), James Moran's *The Composition of Reading Matter* (1965), and Colin Clair's *A History of Printing in Britain* (1965) contain information of interest both to bibliographers and typographers, as does Lawrence Wroth's classic study, *The Colonial Printer* (2nd ed., 1938); and collections of reproductions of printed pages, like Stanley Morison's standard *Four Centuries of Fine Printing* (1924; 4th ed., 1960) or his and Kenneth Day's more recent *The Typographic Book 1450–1935* (1963), by their nature place emphasis on the aesthetics of typography. General histories of publishing, such as Lehmann-Haupt, Silver, and Wroth's *The Book in America* (2nd ed., 1951), Frank Mumby's *Publishing and Bookselling* (4th ed., 1956), and Marjorie Plant's *The English Book Trade* (1939) understandably have less to say about type, but some studies of individual publishers (particularly those who did their own printing) include typographic material.

A recent book which serves as an excellent example of this category is D. F. McKenzie's two-volume *The Cambridge University Press 1696–1712: A Bibliographical Study* (Cambridge, 1966). This monumental work publishes the very full records and accounts of the Press which have been preserved for this period and constructs from them a detailed history of the "Organization and Policy" of the Press. The first volume presents the historical account, with a bibliography of the issues of the Press; the amount of information given about the Press's typography is suggested by the long series of entries under "Types" in the index, or by the table (p. 52) showing the orders for types. The second volume consists of transcriptions of the documents on which the first is based—the Minute Book, the Vice-Chancellor's Accounts, the Annual

Press Accounts, and the vouchers—and the thorough index allows one to locate orders or other transactions concerning any particular type during these years. Primarily financial data of this kind lay the groundwork for typographic history (one thinks of Ellic Howe's 1947 compilation, *The London Compositor*): the enormous amount of detail available in the Cambridge records forms a base from which to generalize about other contemporary printers and publishers. McKenzie's achievement, therefore, is of wider applicability than the title might suggest. And one of its most salutary features is its demonstration of the value of taking into account everything that was being printed in a shop at any one time—for analytical bibliographers sometimes describe the printing of an individual book as if it were the only job the printer had in process.

The next category—consisting of descriptive bibliographies—is in some respects still farther from the typographer's center of interest, for he is not usually concerned with the classification of the various editions, impressions, issues, and states of an author's work. But some sort of statement about typography forms a logical part of any thorough description of a book, and from this point of view the student of graphic arts does have an interest in descriptive bibliography, both as a shorthand way of recording the main features of a book's design and as a guide to the typography of books of the past. It has long been customary for bibliographers of incunabula to record styles of type and the vertical measurements of twenty lines; and Fredson Bowers, in *Principles of Bibliographical Description* (1949), summarizes this method as it applies to books of all periods. Some descriptive bibliographies, of course, include no comments on type at all, while others have elaborate notes on style, point size, leading, type-page dimensions, design of running titles, and so on. Such variations are due not simply to the degree of thoroughness of the bibliographer but also to the nature of his material.

Descriptive bibliographies of the work of particular printers or presses, for instance, obviously call for discussions of typography—such as Philip Gaskell's *Bibliography of the Foulis Press* (1964) or his *John Baskerville: A Bibliography* (1959). The most elaborate recent example is the bibliographical appendix (pp. 174–411) to the first volume of McKenzie's study of the Cambridge Press (1966), mentioned above. Each book printed at the Press between 1696 and 1712 is described with the usual quasi-facsimile title-page transcriptions and collation formulas; in addition, the type used in each major section of a book is identified in

the following form: "Text: English roman (20 ems x 31 lines)." If the reader wishes to see an example of any type described in this way, he can then turn to the "List of Types and Ornaments," where all the types employed by the Press are displayed, generally with full-page samples and extensive descriptive and historical notes. Such a piece of bibliographical research, though primarily historical in its orientation, provides valuable material for the student of letter-forms and book design.

No distinct line can be drawn between descriptive and analytical bibliography, for the techniques of bibliographical analysis are necessarily involved in the classification of impressions and states for a descriptive bibliography. But bibliographical analysis—the process of reconstructing the printing history of a book from the physical evidence found within the book itself—does produce a separate category of material, and one that is likely to appear most remote to the typographer or designer. Since the physical evidence which a book offers consists of paper and of impressions produced by types on the paper, bibliographical analysis is inevitably concerned with type and typography. But the bibliographer, looking for typographic clues that may yield information about the particular printing-house processes which produced a given book, often focuses his attention on what is accidental in the typography of the book —such as broken types or the inconsistent treatment of act- and scene-divisions in plays—so that his work can be considered typographic research only in a special sense. Nevertheless, it demonstrates one of the uses to which research involving type can be put.

Such research is of the greatest significance to the textual critic, for editorial decisions—choosing among variant readings—can be intelligently made only with a knowledge of the kinds of things that happened to an author's manuscript in the printing shop. The spelling habits of the compositors are important, therefore, as are the methods of proofreading employed. In both of these matters—distinguishing precisely among the shares of each compositor and determining the exact order of formes through the press—a principal technique is the analysis of the patterns formed by the reappearances throughout a book of particular pieces of type recognizable by their peculiar damage. A related, though less reliable, technique is the analysis of type shortages by noting patterns in the use of wrong-font letters.

A considerable body of literature on analytical bibliography—and on those techniques involving type—has grown up in the last 25 years, in

connection with the textual study of English Renaissance drama. Although no manual or textbook yet exists, the chief monument of the method, Charlton Hinman's two-volume work, *The Printing and Proof-Reading of the First Folio of Shakespeare* (1963), brings together most of the previous research and demonstrates the use of all the main techniques of analysis. Much of the work in this area has appeared as articles in bibliographical journals rather than as full-length books, and the journal which has been particularly associated with the development of analytical bibliography is the annual *Studies in Bibliography,* edited by Fredson Bowers for the Bibliographical Society of the University of Virginia. Its latest volume (XX, 1967) contains an article by Robert K. Turner, Jr., on "The Printers and the Beaumont and Fletcher Folio of 1647, Section 2," which shows, through a tabulation and analysis of the components of the skeleton-formes, of reappearing types and type shortages, and of distinctive spellings, that the routine procedure in this section of the book was for two compositors to divide the work equally, each setting one page of each folio forme. In many previous articles Turner has been an articulate spokesman for the bibliographical usefulness of typographic analysis, as in his "Reappearing Types as Bibliographical Evidence" in the previous volume of *SB* or his exemplary review of Hinman's work in *Modern Philology* for 1964 (LXII, 51–58). The evidence and the conclusions in the new article are laid out so clearly that it becomes a condensed basic model of the methodology of this kind of research.

A similar use of type-face impressions for historical evidence is the system of "fingerprinting" type outlined by John Cook Wyllie in his Rosenbach lectures of 1960 (unpublished); peculiarities of individual pieces of type, resulting from the casting process, can serve to "fingerprint" a particular font owned by a given printer and can thus help to assign books to certain printers or to trace the transfer of types from one printer to another. However far such activities may be from the ordinary concerns of the typographer, the psychologist, or the student of mass communications, all persons whose research involves type have some interests in common. They may find one another's language incomprehensible at times, but they will always benefit from an attempt to understand that language. Perhaps these few recent examples of the bibliographical uses of typographic research can serve to illustrate the ultimate interdependence of all studies of printed letter-forms.

Skywriting Celebrates Its 45th Year

On a bright May day in 1922 a Royal Air Force pilot, Major John C. Savage, streaked across the skies over Epsom Downs and, trailing smoke behind, scrawled "The Daily Mail." Thus was born the advertising form known as skywriting. . . .

The mechanics of the system are simple enough. A specially prepared oil spiked with a paraffin substance is piped under pressure from a tank behind the pilot. When the oil hits the plane's hot exhaust pipe, it bursts into a billowy white smoke.

The mechanics may be simple, but the pilot has to be an alert and skilled craftsman of the sky. Writing on the ground is one thing. Writing in the sky is a thing quite apart. It is a matter of loops and rolls and dives. In addition there is a reversing process in the writing that must take place or the writing will come out a puzzle. It can be demonstrated if one writes something on a piece of paper and then holds the paper above his head to the light.

Once an absent-minded skywriter was not keeping his mind on his loops and rolls. The result was a lovely "ydnac tfol" in the skies. Dropping down to see what kind of a job he did, the embarrassed skywriter quickly drew a line through the mess and started all over again. . . .

The weather is the *bête noir* of skywriting. It must be perfect—a clear blue sky, moderate winds, smooth layers of air, and few up-drafts and down-drafts. In an average month in the skywriting season—from May through October—there are from six to ten days when skywriting is possible. . . .

Skywriting Corporation of America collects a minimum of $400 for a single job and about $3,500 for skytyping, the latest development in aerial advertising.

[SCA] spent eight years in developing the skytyping technique, and it was introduced for the first time in 1949. Five planes line up wing tip to wing tip in a smooth layer of air. The center plane carries a radio transmitter, which operates the smoke valve in each plane, opening and closing it at will. Thus, the message is traced across the sky in a series of smoke-puffs. From the ground, the puffs look like dots. But they are really about a block long. A skytyped message is accomplished very quickly. No looping or turning is necessary, and the message is completed long before it starts to blow away.

It appears that the skytyping technique is coming along just in the nick of time; there are only six skywriters in the country capable of writing messages in the old-fashioned way. The freelancers, who once abounded in the field, no longer appear to be available.

For a time it appeared that color would revolutionize skywriting. But color is a fickle thing. Red smoke soon becomes a pale pink in the sky and soon the pink becomes nothing at all. Colored smoke also costs four times as much as white smoke and at certain angles the rays of the sun will kill the whole project. . . .

Long names are still a problem for the lone skywriter. One assignment required informing Boston of the winner of a walkathon. The winner was a man named Michelavinski. Fortunately, the skies clouded and the skywriter was spared the task.

Skywriters do have a freedom denied most mortals. One, for example, hated mathematics during his student days. Finding himself with five extra gallons of "ink" at the end of a job, he blithely wrote across the skies of Manhattan: $1 + 4 = 6$. Then he blissfully flew off into the blue.

Print Layout and Design with a Computer CRT System

R. J. Wakefield

This paper is a report on an investigation into the feasibility of using a computer equipped with a CRT display for layout and design work. This investigation was mainly concerned with ascertaining whether a CRT system could create images of sufficient typographic standard, while allowing the size of face to be such that a realistic layout of a page could be represented at any one time. The work was essentially exploratory in nature, but enough was done to enable some conclusions to be drawn.

The most interesting prospect for the use of computers in the printing industry perhaps lies in the field of typography and layout. It should be possible to write computer programming systems that can be run on a computer equipped with a cathode ray tube display to provide the layout man of ability with a tool that could increase both the quality and the quantity of his work. The principal value of such a system is that a layout man would appear to have a type encyclopedia literally at his fingertips. Also, according to need, the display screen would show him the layout he is working on either for over-all effect, for positioning of matter, or for the detailed specification of a part. Specimen typefaces could be called onto the screen and tried at various sizes within the space of seconds. When the complete layout has been settled to the man's satisfaction, it could be recorded on magnetic tape in readiness for automatic typesetting at a later stage. A computer-based system for layout and design work would, by its power and speed, introduce into the normal typesetting process extra time to produce better quality work.

The Work

The first step in the exploration of the feasibility of the above idea was to test the adequacy of a computer display with regard to the definition of images. Fortunate access was gained to the PDP-7 computer at the Cambridge University Mathematical Laboratory,[1] a machine on which N. E. Wiseman had already shown the possibilities of text editing using a computer display.[2] The main emphasis of the pilot work was therefore on the ability of the display to represent specific typefaces to a sufficient typographic standard, while allowing the size of face to be such that a realistic layout of a page could be represented at any one time.

A computer program to control a display consists of a series of instructions directing the path of a beam over a grid of 1024 points by 1024 points making a 9-3/8″ square on the tube face. To create a character on the screen requires a set of instructions that will generate a representation of that particular character. Each set of instructions that describes a character to the display is treated as a unit in itself and is known as a character generator subroutine. Subroutine is a computer term that denotes a set of instructions that are thought of as a logical unit. An alphabet is described to the computer as a set of character generator subroutines, one subroutine for each letter. A line of text is then represented within the memory of the computer as a series of calls to these subroutines. This makes for economy of storage, as a call to a subroutine will take up only two locations in the memory, whereas the character generator subroutine can take anything from 5 to 50 locations.

The first face that was chosen for this exploratory work was Perpetua, and the second, Gill. Owing to a shortage of time and also the extremely laborious method of programming the display, only a few letters in each face were represented on the screen. However, the results were encouraging enough to show that a design system is feasible. In terms of the CRT grid, a unit of 18 points high and 18 points wide was used in which each letter was represented. For the letters chosen, programming took up between 8 and 32 memory locations per character.

[1] I should like to thank Prof. M. V. Wilkes for allowing the use of the machine and Mr. N. E. Wiseman for invaluable advice on programming and operating the machine.

[2] N. E. Wiseman, A Scope Text Editor for the PDP-7/340, University Mathematical Laboratory, Cambridge. (Tech. Memo. 65/3).

The chosen letters were programmed only once for each face but were displayed at different sizes and intensities of beam by using the programming features of the computer. This showed that one could have great economy of storage of character generator subroutines for layout purposes, while at the same time providing an accurate "feel" of the layout.

First of all, the set of characters was displayed more than once on the line, but a difference was made between the brightness of the sets, which showed the flexibility that can be gained by varying the intensity of the beam. In this way light, bold, and ordinary faces can be shown without the necessity of the computer to store completely different sets of character generator subroutines. The light and bold effect can be simulated by varying the intensity of image that the beam traces.

Another feature of the computer that was exploited was the facility to vary the size of an image by merely setting a scaling factor. To examine this feature the characters were first displayed at the top of the screen in their absolute size of 18 units high. Then the same character generator subroutines were used to display the characters further down the screen, but the scaling factor was set to 2. This operation was repeated twice more with the scaling factors of 4 and 8. In this way the same character generator subroutines were utilized to display simultaneously the characters at four different sizes (Figure 1). The

Figure 1.
Perpetua and Gill characters generated on CRT display.

purpose was to discover the point at which the image lost validity due to over-expansion of the basic pattern. It was found that the image scaled by 2 was excellent; by 4 was still good; and by 8, although obviously patchy, a fair impression was retained. This suggests that another saving could be made in terms of storage of character generator subroutines by judicious programming of a basic size and scaling it up. Obviously, with a restriction of scaling factors of 2, 4, and 8, there would have to be a set of basic sizes for any typeface.

Experience showed that an 18-point grid was not ideal for the purpose of displaying a specific typeface. It is felt that 24 points are perhaps needed in the vertical plane to represent a face in 6 point; therefore 40 lines could be accommodated on the screen, with 80 characters to the line, allowing 12 points in the horizontal plane per character.

Suggested Features of a Complete System

If the basic feasibility of using a computer CRT for layout work is accepted, what features must the programming system provide so that the computer can be used as a comprehensive design aid?

A control program resident in the computer must accept text items, entered from a computer keyboard, and commands to set the text in a particular typeface. A light pen can be used to command the system to perform an operation on that text, either to move it about the screen, reset it in another face, or change the size. The layout man should also be able to 'draw' in, by means of the light pen, rough representation of half-tone pictures, slabs of colour and outline drawings. One point that needs careful thought in any proposed system is that the intensity of images will vary greatly according to the amount of matter on the screen.

Another feature that a system must provide is an allowance for the times when the display will not be large enough to carry the whole layout in detail. The program should permit the visualiser to change focus, as it were, by first giving a general impression of the whole, then homing in on a part of the design to represent type in detail, followed by a return to the general view to review any change in the over-all effect of the layout. This last feature will need a fair amount of immediate access memory store to carry the programming for more than one display picture.

Secondary Uses of Letters in Language

Yakov Malkiel

In the context of this article the secondary uses of letters are those that involve not the mere recording of pre-existent speech forms, but full participation, as independent ingredients, in a given language. Five such autonomous uses have been set off: (1) the conventional arrangement of letters in standard alphabetic order and the special functions of chosen segments of that sequence; (2) all manner of abbreviations (truncation, literation, acronyms); (3) diverse implications of the shapes of the letters; (4) references—difficult to detect—to the acoustic shapes of the letters; (5) hints of the conventional labels given to letters in spelling-out aloud. Special attention has been given to the occasional interplay of these uses, whose frequency seems to advance by leaps and bounds in such societies and cultures as place a premium on "modernity."

NOTE: "Secondary Uses of Letters in Language" is being published in two parts. This is the second part; the first appeared in the previous number of this Journal, January 1967.

Abbreviations

Though the use of abbreviations is very old, their current vogue is unprecedented. Also, while the motivation was once consistently utilitarian (scarcity of costly writing material, lack of precious time, etc.), it has in this century become smart and stylish to use them in certain contexts. The modern world's two leading countries are most commonly referred to in this manner: *US*(*A*) and *USSR* (=Russ. *SSSR*), as are also the major international organization (*UN*), influential political, military, economic, and cultural alliances (*NATO*, *SEATO*) and agencies (*UNESCO*), and countless entities of the body politic. The old, thoroughly outmoded acrostic has now been replaced

by the acronym and its vars.;[22] in fact, the officious book market already offers dictionaries of the constantly mushrooming acronyms.[23]

Truncation. The psycho-social matrix of the craving for abbreviations (on the one hand, a connubium of science and advertising; on the other, an urge for privacy, seclusion, humor, imagination) is not at issue here;[24] what matters is less the root of the fad than the specific

[22] This is not the place to review the history of the acrostic, which left such important traces in Guillaume de Machaut, Froissart, Gervais du But, Villon ("Ballade de bon conseil," "Ballade des contre-verités"), also in medieval Latin and even in medieval Hebrew poetry. The device reached its climactic point in the 14th and 15th centuries.

[23] One such venture is H. Baudry's *Nouveau dictionnaire d'abréviations, «D.A.» françaises et étrangères, techniques et usuells, anciennes et nouvelles,* rev. ed. (La Chapelle Montligron [Orne], 1956), cf. M. Cohen's ironic assessment in *BSLP,* LII:2:17f. The American counterpart appeared later: M. Goldstein, *Dictionary of Modern Acronyms & Abbreviations* (Indianapolis, 1963). The standard treatise on abbreviations in modern French is H. Kjellman, *Mots abégés et tendances d' abréviation en français,* UUA, Year 1920, No. 2; cf. L. Spitzer's favorable and stimulating appraisal in *LGRPh,* XLIII (1922), cols. 27f., with a heavy stress on the intrinsic intimacy of many shortened forms and on the reckless exploitation of this mood by hard-boiled advertisers. Kjellman himself isolates and examines several abbreviatory schemata of little concern to us here, e.g. those involving (a) reduplications: *bobosse* = *bossu* 'hunchback,' (b) apocope: *sous-off(icier)*, esp. *auto, métro, photo, stylo, vélo,* which call to mind coll. Engl. *homo(sexual)*, *memo(randum)*, *mono(nucleosis)*, *polio(myelitis)*, *psycho(path)*, and (c) apheresis: *(mar)chand.* Interesting is his discovery that the French "letter-words" (which bear squarely on our problem) reflect, in the last analysis, an English fashion. On the current state of affairs in Spanish see R. Lapesa, "La lengua desde hace cuarenta años," *Rev. de Occid.* (Nov.-Dec. 1963), pp. 193–208, esp. 201ff., and D. Alonso, *Del Siglo de Oro a este siglo de las siglas* (Madrid, 1962), pp. 7f.

[24] The connotations are very numerous and sometimes elusive; they involve secrecy, mock-secrecy, encoding, as in *(V)IP* ← *(Very)Important Person,* with overtones of top-level diplomacy; evocation of an intimate circle of workers, of a coterie, etc. (*SLOM* ← *Selective List of Materials*, readily understood only at the MLA Headquarters); folk-etymological, sometimes pious reinterpretations, as is conceivably true of *SOS* ← *Save Our Souls*; malicious—reading into *SPQR,* as did Rabelais, *si peu que rien,* or into the Spanish epistolary formula *s(u) s(eguro) s(ervidor)*, as have done college students, some nonsensical remark (*siempre serás salvaje*), or else decoding, as with Berkeley's *FSM* (1964–65) ← *Free* (later: *Filthy*) *Speech Movement*; veiling, if not total avoidance, of taboo words, of downright profanity, etc., or squeamish reference to "intimate" body functions (*S.O.B., T.B.* ← *tuberculosis* [once a scare word], *V.D.* ← *venereal disease, B.O.* ← *(offensive) body odor, W.C.* ← *water closet* ('toilet'); rescue of inordinately long and foreign-sounding words for familiar objects from the sphere of pedantically academic discourse (*T.V.* beside *telly* ← *television*). The

linguistic conditions under which it materializes and thrives. Even within the frame of this general limitation one further retrenchment is necessary: such abbreviations as involve chunks or torsos of words—the classic example is *do, re, mi, fa, so, la, si*—as against plain letters (typically, initial letters), do not qualify for inclusion. Thus, such instances of plain "truncation" as G. *Sozis* 'Socialists' and, later, *Nazis* 'National Socialists,' *Gestapo* ← *Geheime Staatspolizei* or E. *commies* 'Communists,' Am.-E.—typically, in the jargon of college students—*Caltech* 'California Institute of Technology,' also *Comp(arative) Lit(erature)*, *Home Ec(onomics)*, *dorm(itory)*, *prof(essor)*, or—in the plural—coll. *fed(eral)s*, *seg(regationist)s*, or again Russ. *Smers* 'counterespionage agency' (← *smert' spionam!* 'death to the spies!'), *Čeka* 'state police', lit. 'emergency commission' (← *Čerezvycajnaja Komissija*) do not answer the description of the problems directly relevant in this context; [25] conversely, *AEG* ← *Allgemeine Elektrizitatsgesellschaft, GMBH* ← *Gesellschaft mit beschrankter Haftung, SA* ← *Sturmabteilung* and *SS* (written with two stylized S's: angular and elongated) ← *Schutzstaffel*, or *GPU* (a later name for *Čeka*) decidedly do. Compounds involving an abbreviation and a full word, in this order (type ⌜*U-boat*⌝), are of peripheral relevance and invite, after incidental mention, a brief separate discussion.

Deceptive abbreviations. Certain very special situations must, at the outset, be deducted from the reservoir of an increasingly abundant

original formula may be almost universally forgotten, as in Am.-E. *G.I.* 'enlisted soldier' (← *Government Issue,* stamped on certain supplies).

[25] This type of abbreviation—involving juxtaposed slivers of key-words—reached its peak during and after the Russian Revolution, though the genesis of the model precedes the political events. Early examples include *ispolkom* ← *ispolnitel'nyj komitet* 'Executive Committee" and *linkor* ← *linejnyj korabl'* 'battleship'; cf. *agit (acionnaja)-prop(aganda)*, *pol-* and *torg-pred* ← *političeskij* and *torgovyj predstavitel'*, respectively, *kol-* and *sov-xoz, glavkom* ← *glavnokomandujuščij, kombrig* ← *komandir brigady, univermag* ← *universalnyj magazin* 'department store,' *polit-otdel,* and *raj-kom,* even *medsestra* 'medical nurse' and *medsanbat* 'medico-sanitary batallion.' Similarly, *Gestapo,* under another totalitarian régime, was preceded by *Sipo* ← *Sicherheitspolizei* and later followed by *Vopo* ← *Volkspolizei,* while *Politische Polizei* was, for obvious reasons, left alone. Progressive pre-revolutionary Russia favored literation (*èser* ← *social revoljucioner*), occasionally with additional consonantal support from other segments—medial or final—of the words concerned, e.g. *kadet* ← *konstitucionnyj demokrat, èsdek* ← *social-demokrat.* (In these abbreviations *-ek* and *-er* are actually to be pronounced with an /è/.)

material. There exist deceptive cases, as when an *L-train,* known to Chicagoans and formerly to New Yorkers, stands for *El(evated)*, in sharp contrast to Berlin's *U-Bahn* (*Untergrundbahn* 'subway') and *S-Bahn* (*Schnellbahn* 'rapid transit'), or when *X* before a telephone number functions as a substitute for *Ex(tension)*. The abbreviation proper, though clearly isolable, is here subordinated to a kind of rebus-like puzzle (see below). *K.O.* 'knock-out punch in boxing' is a genuine abbreviation (favored by sensational headlines) which, with the world-wide prestige of this American sport, has spread even to countries where its compositional design is not fully understood, cf. G. *K.O.* /kao/, and *T.K.O.* ← *technical knock-out* is following suit; but *O.K.* may well be a pseudo-abbreviation for the following pair of visibly related words (of controversial ancestry [26]) : a verb enjoying considerable acceptance on the scale of formality ('to confirm, endorse') and a far commoner but distinctly familiar adverb or interjection (some educated speakers willingly use *to okay,* but are reluctant to substitute *O.K.* for 'all right'). Trenchant It. W for *Evviva!* is unique in its use of a single foreign letter, or a graphic approximation thereto, as a near-equivalent in shape of two identical native letters; placed upside down, the sign conveys the opposite message: 'abbasso!'. Arbitrarily disguised as an abbreviation of two words is *I.D. Card* ← *IDentification card.* Where written abbreviations involve foreign-language formulas, their reading-aloud, I repeat, may involve the substitution of vernacular equivalents: *e.g.* ← *exempli gratia* (commonly pronounced "for instance"); *i.e.* ← *id est* ("that is"). A Greek letter, endowed with its original value, has infiltrated Latin script in *Xmas* ← *Christmas,* popular in the English-speaking countries; cf. also *X Science* ← *Christian Science* and recall the above-cited passage from Lope's *Peribáñez.*[27]

[26] The older literature on the subject is unfathomable. Even the critical digest of earlier conjectures has swollen to inordinate proportions; see, in *AS,* W. A. Heflin, "*O.K.* and its Incorrect Etymology," XXXVII (1962), 243–248, and A. W. Read's successive elaborations: "The First Stage in the History of *O.K.*," XXXVIII (1963), 5–27; "The Second Stage in the History of *O.K.*," XXXIX (1964), 5–25; "Later Stages in the History of *O.K.*," XXXIX, 83–101; "Successive Revisions in the Explanation of *O.K.*," XXXIX, 243–267.

[27] In his memorandum W. E. Geiger observes the disturbing polysemy of the symbol *X,* which stand for 'Christ, Christian' through dual reference to the Greek letter X (in *C*hrist) and to the cross as associated with the crucifixion. In addition *X* acts as a traffic symbol: *X-walk* 'cross-walk,' *X-road* 'cross-road,'

Literation versus acronym. The two basic varieties of the acronym are conditioned by the readers' desire either to pronounce each letter with its full label, a procedure known as "literation," Fr. "épellation" (Am.-E. *GOP* ← *Grand Old Party,* R. *RSFSR* /èrèsèfèsèr/ 'Great Russian Soviet Republic,' G. *KDP*/kapede/ ← *Kommunistische Partei Deutschlands,* Braz.-Ptg. *UDN* /udene/ ← *União Democrática Nacional,* similarly *PTB* ← *Partido Trabalhista Brasileiro* and *PSD* ← *Partido Social Democrático,* or to credit each letter strictly with its phonetic value, as in *WAC* ← *W(Omen's) A(rmy) C(orps), radar* ← *ra(dio) d(etecting) a(nd) r(anging),* R. *TASS* ← *T(elegrafonje) A (gentstvo) S (ovetskogo) S (ojuza),* and coll. Fr. *URSS* ürs/. The latter device (the acronym *stricto sensu*) is the more remarkable of the two, both linguistically (because it tends to create entirely new words, not just strings of familiar labels for letters which, in the last analysis, represent mere compounds) and stylistically (inasmuch as the boldness of certain uncommon sound sequences may have some kind of shock effect, sounding a clarion call to action, provoking laughter, etc.). Preferences as between the two procedures vary widely from language to language and from abbreviation to abbrevation, depending, broadly, on national attitudes toward humor, improvisation, originality and, narrowly, on degrees of sheer pronounceability; for G. *KZ Konzentrationslager* 'concentration camp' (pronounced /kacet/) speakers seemed to have little choice a generation ago, though in present-day America the comparable difficulty of pronouncing *SNCC* monosyllabically has been successfully circumvented by the introduction of an auxiliary vowel: /snɪk/ (obviously preferred to *snack,* inopportunely reminiscent of a light meal, and to *snuck,* offensively suggestive of 'sneaking' [28]). Emphatically informal /snɪk/, appropriate to the

RXR (or *RR-X*) 'railroad crossing,' accompanying *cross* in its semantic expansion through—to use B. Migliorini's apposite term—"synonymic radiation." Within the modern context of congested highway traffic, but with a hint of the older religious use, the cross, as a deterrent, may mark the spot of a fatal automobile accident. As if this measure of ambiguity were insufficient, the *X* is used as an elementary mathematical symbol ('multiplied by'), functions informally as a rebus for *EX(tension)* in telephone numbers, and plays a rôle impervious to the uninitiated in the all-important *X-ray* (as against G. *Röntgenstrahl*).

[28] In colloquial American English, *snuck* rivals *sneaked* as the simple past. The vocalization of SNCC reminds many observers of Lewis Carroll's "jaberwocky" in *Through the Looking-Glass and What Alice Found There* (1871–72),

an eagerly awaited operation; *H-hour,* the decisive hour, etc. One finds traces of this use in ultra-modern French: *L'heure H,* and elsewhere.[32] The starting-point is patently the well-known preference of logicians and mathematicians for "Point *P*," "Sentence *S*," etc. (*Zero hour*—which involves a numeral, not a letter—has its root in a different military tradition, but not—counter to a widespread belief—in the kind of count-down practiced at missile sites).

The abbreviation reaches its maximum of effectiveness where a blunt gesture conjures up the convolution of a letter readily associated, in turn, with a slogan or catchword. Churchill's famous rallying formula "V for Victory" and the accompanying aggressive movement of two adjoining fingers immediately come to mind.[33] (These were often accompanied by the first four notes of Beethoven's Symphony No. 5 in C Minor, which symbolize the International Morse Code for the letter 'V"—dot, dot, dot, dash.)

Interplays of analogy. The world of abbreviations, a separate microcosm though hardly one hermetically sealed off from other avenues of communication, has its own rules for interplays of analogy. The extreme rarity of word-final *-rs* in modern French makes one wonder whether the formal and semantic proximity of *URSS* /ürs/ and *ours* /urs/ 'bear' (the name of the animal traditionally emblematic of that country) could be plausibly attributed to coincidence; here the thread of a common noun of long standing and that of an ultramodern abbreviation for the name of a country appear inextricably interwoven. Conversely, a perceptive observer not so long ago reported from Alabama that the highly erratic, if amusing, abbreviation SLIC for *S.C.L.C.* ← *Southern Christian Leadership Conference* was launched by some experimentally minded speakers involved in an event all

[32] I know of one facetious variation on *D-Day.* On July 15, 1964, at the height of the Republican Party's San Francisco Convention, one local newspaper came out with this flashy headline: *"B-Day* for *Barry* Goldwater." One is tempted to place in this area of connotation the title of the motion picture, *Dial "M" for Murder.*

[33] The element of humor is very potent in all categories of abbreviations; coll. G. (Berlin) *j.w.d.* /jotvede/← *ganz weit draußen* derives its impact from the jocular symbolization of the initial consonant in *ganz* by *j,* in tribute to the local substandard pronunciation. Intimacy, restriction to a closed social circle (G. *Uni* ← *Universität* among students), even to the sphere of a single family or a couple, and prudishness have been additional factors in truncation, literation, and acronymics alike; cf. fn. 24, above.

participants of which freely used SNIC for *S.N.C.C.* Here, strictly within the realm of nascent acronyms, one minor irregularity is seen gradually spawning another, of far greater magnitude.[34]

Proper names. The use of abbreviations in proper names is a multidimensional problem transcending the narrow frame of this essay. Let me simply enumerate its most conspicuous dimensions: the affectionate truncation of first names in hypocoristic variant forms (cf. E. *Abe, Dan, Dave, Sam, Sol* for men; *Pam, Pat* for women, though in the ranks of the latter the addition of *-ie, -y* is widely practiced, regardless of age: *Jackie* from *Jacqueline, Abby* from *Abigail*[35]); the acceptance in certain social contexts of literation in familiar address and in deliberately informal signatures—a fad that has frequently led to the coinage of nicknames;[36] the use of initials alone (or of an initial plus a favored segment of the family name) in the identification of authorship and, at a later stage, the creation of an acronymic *nom de plume.*[37]

[34] See Renata Adler, "Letter from Selma," *The New Yorker,* April 10, 1965, pp. 121ff., esp. 121*c* and 122*b*.

[35] Other languages achieve roughly the same effect through reduplication of the core syllable: *Pepe* from OSp. *Jose-pe,* or through suffixation (often in conjunction with truncation), cf. It. *Giacom-ino,* G. *Hein-i* (from *Heinrich*), *Rud-i* (from *Rudolf*), and *Ton-i* (from *Anton*), R. (a) *Alë-ša* (from *Aleksej*), *Anto-ša* (from *Anton*), *Ja-ša* (from *Jakov*), *Ma-ša* (from *Marja,* (m., f.) *Saša* (from *Aleksan-dr* or *-dra*), or (b) *Kolja* (from *Nikolaj*), *Kostja* (from *Konstantin*), *Nastja* (from *Anastasja*), *Polja* (from *Paulina*), *Sonja* (from *Sofja*), *Tolja* (from *Anatolij*), *Vanja* (from *Ivan*). Truncation in this context involves apheresis as often as it does apocope; and a teasing effect can be produced by the addition of a masculine suffix to a feminine name, as in French (*Marie* ~ *Marion*), under conditions investigated by Gilliéron and, later, by Spitzer and Hasselrot. On the Spanish material see P. M. Boyd-Bowman, "Cómo obra la fonética infantil en la formación de los hipocorísticos," *NRFH,* IX (1955), 337–366.

[36] In current American English practice, addressing a person (often an older partner or one particularly respected) by his initials—say, *X. M.* for *Xavier Miller*—marks the selection of a level of social contact approximately intermediate between those characterized by "first name" and "formal" address. In academic circles nicknames have frequently sprouted from such literations; thus, the late medievalist Ernest H. Kantorowicz (cf. *RPh.* XVIII, 1–15) was known to his intimates as *EKa* (pronounced in German fashion), because he signed his memos "E. Ka." Extra-economical newspaper headlines, on the other hand, have propagated the use of initials for the names of this country's presidents (*FDR, JFK*).

[37] Such *noms de plume* have, to be sure, a slightly journalistic ring. Thus, the contemporary Argentine writer Héctor F. Miri signs his pieces *Hefeme,* an odd composite in which one discerns *efe* for the middle initial and *eme* for *M-*, but

Sequences of identical letter-sounds. One cluster of minor problems concerns the succession of identical letter-sounds, entirely by themselves or as parts of longer formulas, as the *-AA-* in *NAACP* ← *National Association for the Advancement of Colored People,* the *-LL-* in *FILLM* ← *Fédération Internationale des Langues et Littératures Modernes,* the *-RR-* in *UNRRA,* the *-SS-* in *OSS* ← *Office of Strategic Services* and, at the opposite end of the political spectrum, in *TASS*. Here the acronym, as a written formula, is unimpeachably explicit; but in oral delivery it falls short of yielding an accurate clue to the full name, especially where consonants are at issue and the language involved is, like French, unprepared for gemination; as a result, one nugget of the information to be conveyed tends to go astray. Where no segment precedes, or follows upon, the bare repetition of a consonant, speakers must have recourse to literation. A certain shrillness of the message—perhaps in unavoidable recoil from the threat of monotony—is, typically, the consequence. This overtone may be welcome as a purveyor of emphasis or even as a tool of intimidation; not for nothing does Himmler's *SS* almost match, in its graphemic pattern, the American South's older *KKK* ← *Ku-Klux-Klan* (initially organized: 1867–77; revived in 1915), a name which has, rather characteristically, outlasted such early regional competitors as "Knights of the White Camellia," "White League," and "Invisible Circle." By the same token, any gentler message will be clad in a less strident phonic garb; witness

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no *hache* for *H-*. At the beginning of this century, one of two Russian writers bearing the same name *Vasilevskij* added to that name *bukva* 'letter,' and the other *ne-bukva* 'non-letter.' One protagonist in Vladimir Tendrjakov's novel *Svidanje s Nefertiti* (Moscow, 1964) is nicknamed by his classmates *"Mys* without a soft sign,' to distinguish rather coarsely, or even derisively, the spelling of his name from that of the common noun *mys'* 'mouse.' Teams of writers and artists may devise semi-jocose names to mark their joint authorship; such artificial names, as a rule, are composite, containing torsos or fragments of each member's original name. Frequently, the initial syllables are conjoined; thus, the exiled Russian poets *Mixail Gorlin* and *Raisa Blox,* romantically linked and later married, signed some of their poems *Mirajev,* while three Russian painters working on their homeground, *M. Kuprinov, P. Krylov,* and *Nik. Sokolov,* exhibit under the joint name *Kukryniksy* (1965). If the first syllable from one man's name and the last from his partner's name were to be amalgamated, the result—in terms of linguistic architecture—would be the same as in E. *liger* 'cross-breed of lion and tiger,' Am.-E. *brunch* (*breakfast* × *lunch*), *smog,* and *hottle* 'hot bottle' (for tea or coffee). Cf. also *Tanzania,* the name of a new African country (*Tanganyika* × *Zanzibar*); and Fr. *franglais* 'Anglicized French.'

the semi-formal *Three-D Policy* ("Determination, Deliberation, Discussion") quite recently proclaimed by the President of this country, a slogan which, on the linguistic side if not in substantive value, calls to mind the *Tridelts* (members of the *Tridelta* = ΔΔΔ Sorority). Old-timers to this day remember *3-D movies* 'three-dimensional motion pictures.'

Transmission from language to language. Where latter-day contacts between languages of roughly comparable structure are involved, abbreviations are apt to spread in different fashions. One possibility is, first, to translate the full name of the agency, bureau, organization, etc., then to produce, from the resources of the target language, a new abbreviation, entirely independent of the old. *U.S.A.* thus becomes *EE. UU.* in Spanish and США in Russian (while Fr. *États Unis* and G. *Vereinigte Staaten* seem compatible with unassimilated, capsulized, *U.S.A.*); *U.N.* emerges as *ONU* in Italian, *OH* in Russian, etc. The alternative is to carry over, into the target language, the phonic content of the literation from the source language, as when Russian newspapers in New York transcribe NATO by НЭЙТО and SEATO by СИТО, blurring in the process the identity of some vital constituents of the original formulas. A rival transliteration, not quite so reckless, renders *A.F.L.* by ЭйЭфЭл and *C.I.O.* by СиАйО, using the interplay of capitals and lower-case letters as a means of helpful audio-visual guidance and hierarchization.[38]

The Shape of the Letters

If the conventional sequence of the letters in the alphabet is something inherently abstract, the individual configuration of each link in that

[38] I cannot here expatiate on all manner of abbreviations currently employed in technology, but shall quote from W. E. Geiger's helpful memorandum on the use of Radio and TV international call-letters, "an easily datable category which may reveal trends and fancies in letter usage, e.g. (a) esoteric: *WBBM* and *WGN*, both Chicago; (b) partially transparent: *WCOP*, Boston (*W-C-O-P* or *W-COP*), and *KBEE*, Modesto (*K-B-E-E* or *K-BEE*); (c) network affiliation: *WCBC*, New York, and *KCBC*, San Francisco (Columbia Broadcasting System); (d) place or origin: *KPHO*, *Pho*enix, Ariz., and *KCMO*, *K*ansas *C*ity, *Mo.*; (e) metaphorical or humorous (designating some local trait or its desired opposite): *KOOL*, Phoenix, and *KOLD*, Tucson (a pleasant relief from Arizona's desert climate?), or *KABL*, Oakland-San Francisco (evoking S. F.'s historic *Cable*-Cars)." A preference for metaphor over literation seems to characterize the names of those stations established after 1945. Add Radio *KAL*—a student-operated and -managed radio station in Berkeley.

chain involves an immediate appeal to the readers' and writers' visual impressionability. Especially if the printed capital letters are slightly stylized, in the directions of straightening, rounding, or tightening, their basic geometric design may stand out very sharply, as when the O in Latin script, reduced to its bare essentials, signals a complete circle; the T suggests three quarters of a cross and the C, three quarters of a circle; the A marks a triangle on two feet (in contrast to Greek delta = Δ, a plain equilateral triangle) and the B, two semi-circles springing from a perpendicular line, etc. Some of the distinctive Cyrillic characters (the Ш and the Ж, say) display a beautiful symmetric contour. Within the realm of anatomy, two salient malformations of human legs are crisply described by the German tags *X-Beine* 'knock-knees' vs. *O-Beine* 'bandy legs, bow legs' (a pattern imitated by Estonian, cf. mod. Gr. λαβδός [adj.] 'knock-kneed,' from the characteristic outline of λαβδα). In modern American industry and merchandising, in the symbolization of traffic rules (made of late international on European highways), and in many other domains of contemporary living, the angle or curve of the capital letter conveys a brief message, instantaneously assimilable and extremely graphic. What could be more plain than a *Y* for: 'Watch out for the bifurcation of the causeway!' or, viewed in the opposite direction, for 'Merging traffic'? Grammatically the pattern, at least in English, involves a compound, in which the first ingredient (the name of the letter) serves as the prime qualifier of the second; cf. the dressmaker's *A-skirt* and *V-neck-(sweat)shirt* (or *-blouse,* or *-sweater*); the architect's *A-frame*; the butcher's *T-bone steak*; the driver's and traffic-policeman's *U-turn* (as against clumsier *hairpin-curve*), etc. Adoptions of this striking pattern in the Romance languages have necessitated certain adjustments to different syntactic conditions, cf. Fr. *décolleté en V*.

One visualizes two different classificatory approaches to this copious stock. The analyst may take as his point of departure the "designatum" and ask himself what material features of mid-twentieth-century civilization best lend themselves to this class of labeling. Up-to-date reference works like the *Merriam-Webster New Intern. Dict.,* supplemented by first-hand experience and reports of witnesses, show *T-* as an accepted qualifier of *abutment, bandage, bar, beam, bob, bolt, bulb, cart, cloth, connection, crack, cross, hinge, iron, pipe, plate, rail, rest, slot, square*; *T-straps* in women's shoes were a fad ca. 1960. On

balance, not all these bits of evidence fall under our rubric: since *T-cloth* is described as 'cotton-cloth stamped with a T, made in Great Britain and sold in Asia,' the convolution of the object is not at issue and the item must be discarded from our list (just as *U-boat* and *U-turn* belong to radically different categories). The remaining cases, however, seem homogeneous (a *T-cart*, e.g., has a "body shaped like a T") and prove that handicraft and industry have been the main contributors and that deft mechanics, inventive construction engineers, and imaginative manufacturers, jobbers, and retailers of tools must all have had a heavy share in this nomenclatural vogue.

Far more exciting for the graphemicist is the classification by letter, i.e., by the "designans." Capital letters in modern Latin script are not all endowed with an equally impressive shape; *E, H, X,* and *Z* boast a symmetry sorely lacking in *F*; *I* has a neatness of design absent from *J*; *G, P,* and *R* suffer from a certain complexity of configuration, as does *Q*,[39] and as do Cyrillic Ы, Ю, and Я; *Y*, I repeat, has an exciting quality of convergence or divergence. Other members of the alphabetic set, notable for their pleasingly ornamental or alarmingly dramatic silhouettes, play a role commensurate with these advantages of delineation. The *T*, we recall, figures prominently here (and measurement with the *T-square* has given rise to such phrases as *It suits*—or *fits —me to a T* 'precisely, exactly'). The *L* is also noted for its angularity, which has been highlighted by the title of a widely acclaimed British motion-picture: *The L-Shaped Room*. The *S*, characterized by litheness and sinuosity, is familiar not only from road signs (*S-curve*), but also from a compound like Pol. *esyfloresy* (pl.) 'arabesque design based on the letter S.' The sharp changes in direction marking the outline of the *Z*—noted for its acute angles—have added to the cross-linguistic appeal of G. *Zickzack,* Fr. *zigzag* (older spelling: *zigue-zague,*) etc.;[40] on the moral level ('shiftiness, fickleness'), they

[39] Amusingly, some cultured and refined speakers of English associate *queue* (in reality, an obsolescent word for 'tail,' of transparent French ancestry) with the queerly shaped letter *Q*.

[40] E. *zigzag,* Sp. *zigzag,* Ptg. *ziguezague,* Pol. *zygzag,* Russ. *zigzag,* etc., in some instances with further derivational offshoots (e.g., Fr. *zigzaguer* and Sp. *zigzaguear* 'to zigzag'—from which I would not hesitate to extract the action noun *zigzagueo*); but It. *zigzag* seems unicuspidal (*una strada a zigzag; andare, cominciare a zigzag*). The starting point is apparently G. *Zickzack,* characterized by its neat vowel alternation *i-a* within a rigid consonantal frame. Such lexical items are, as a rule, facetious in tone and onomatopoeic either in actual origin or, more frequently, in secondarily acquired overtones; cf. W. Busch's

account for coll. Fr. *être fait comme un z* 'to be a fraud.'

On the whole, it is the basic contour of the letter that tickles the imagination of speakers. Under special circumstances, however, a minor stroke or so little as a diacritic mark may capture the focus of attention. This is true, in English, of the twin pharses *dotting the i's* and *crossing the t's* 'leaving no detail or nuance unexplained'; in either instance reference is, for once, to the lower-case character (cf. Fr. *mettre les points sur les i*, It. *mettere i puntini sugli "i"*). Representatives of North Albanian and South Albanian intelligentsia—who experimented, until recently, with rival dialects, differently spelled, as literary media—used to taunt each other with such reproaches as "blinding the *e*'s" (in reference to *ë*) and "slashing vowels." The Yiddish stereotyped phrase *mət ə dugəš* 'with emphasis, with heavy insistence' involves a dot-like diacritic mark (placed inside, seldom alongside, the character) which denotes the gemination (lengthening) or the obstruent pronunciation of certain consonants in Hebrew. A freewheeling writer, taking his cue from phraseology so slanted, is at liberty to go much farther in his similes and metaphors, as did in fact a French romantic poet in musing: "Sur le clocher jauni, /La lune,/ *Comme un point sur un i,*" or as did Christian Morgenstern in his "Fisches Nachtgesang," suggesting by the marks ordinarily reserved among classicists for vowel length vs. brevity (– ∪) the open or closed mouths of a school of fish, while an exiled Albanian may grimly recognize in *K* (evocative of *Komunizëm*) the dim silhouette of a man dangling from a gallows. (For an empty gallows capital Cyrillic "g," namely Г, would provide a matchless sketch.) In his *Greguerías* R. Gómez de la Serna muses repeatedly on the profile of letters, both capital (*S, X, T, H, F, W, D,* in this order) and lower-case (*ñ, ü*); usually the object will suggest the

slightly discrepant "*Ricke-racke, ricke-racke*/geht die Mühle mit Geknacke" in the most celebrated episode of *Max und Moritz;* also Sp. *tictac* beside E. *tick-tock, ping-pong,* and many other increasingly current words, some of them truly international, others definitely confined to a single language—particularly the verbs: to *flip-flap, tittle-tattle* (to a few such items a suffix is firmly welded: *wishy-washy, shilly-shally*). The *z,* then, was initially—on the articulatory or the acoustic-auditory level—an incidental element of *zigzag* and by no means a prime determinant of its meaning. But with the gradual rise of literacy, the secondary, visual association of the shape of *z* with the word's semantic content turned out to be so opportune and spellbinding as partially to overlay (or to reduce to subordinate rank) the original set of relationships. A separate etymological cameo on this pan-European word is a pressing desideratum.

letter: "El cisne es le *S* capitular del poema del estanque" (p. 49); sometimes the shape and the specific place of the letter within the alphabet jointly stir the writer's imagination: "La *H* es la escalera del alfabeto" (p. 78); or one letter will evoke another (p. 92); or else a letter will suggest an action devoid of relationship to other letters (p. 99). But these artistic rêveries and idiosyncratic reactions transcend the precinct of language proper, viewed as the backbone of speech-communities.[41]

[41] I cannot elaborate here on the artistic potentialities of the letters. The exquisite ornamental uses of letters in Oriental, esp. Arabic, script are well known; so is the fact that the intricacy of Chinese characters tends to blur the frontier between painting and exquisite writing. Modern Western taste rejects the pretentious ornamentation that encumbered certain styles of nineteenth-century lettering through flourishes, distentions, elongations, crosshatching; in particular it frowns on the capitals of "la belle époque," clumsily loaded with nudes, etc. On the other hand, the twentieth century has discovered a new affinity between calligraphy and the visual arts, a kinship for which ultramodern "precisionism" provides the clinching argument. Isolated letters and word fragments have figured in avant-garde paintings since shortly before the First World War. Georges Braque's "Soda" (1911) and "Oval Still Life" = "Le violon," Gino Seveini's "Dynamic Hieroglyphic of the Bar Tabarin" (1912), Pablo Picasso's "Card Players" (1913–14) and "Green Still Life" beside "Pipe, Glass, Bottle of Rum" (1914), and Juan Gris's "Breakfast" (1914) beside "Grapes and Wine"—all eight displayed in New York's Museum of Modern Art —are cases in point, illustrating (to quote a recent comment on Leningrad's Hermitage Collection) the "interplay of geometric planes and commercial lettering"; and in "Private of the First Division" (1914) by Kazimir Malevic separate Cyrillic letters and words in Cyrillic script are allowed to act as ingredients. As early as 1916–18 Paul Klee composed picture-poems, the almost illegible text of which merged with the colored squares; toward 1930 he was inspired by Arabic script. In his "W-geweihtes Kind" (1935) the W-shaped frown on the child's contorted face invites a dual or triple interpretation: (a) letter *W* /ve/, (b) *Weh* /ve/ 'grief,' perhaps (c) *W-eihe* 'consecration.' Characteristically, in Joan Miro's piece "Women With Undone Hair Greeting the Crescent Moon" (1939) the Chinese character for 'woman' flanks her symbolic delineation. Into Saul Steinberg's "Design" both stylized (embellished) and nonstylized letters enter on a par, as important ingredients. In Mark Tobey's "Calligraphic Structure" (1958) one sees stylized, dimly recognizable letters and light-colored "litteroid" signs projected against a background of red. See R. Étiemble, *The Written Word* (London, 1962), pp. 88 (Fernand Léger, "Still Life" [1925]), 90 (Henri Michaux, "Signs" [1951]), 91 (Marinetti, "Words" [1919], 94f.).

I am, on the whole, not concerned here with such uses as involve modified shapes of the letters. But let me quote, for the sake of its typographic piquancy, this excerpt from G. A. Shipley's memorandum: "In the Southwest and West of the United States, the alphabet is put to distinctive use in branding horses

The Acoustic Image of the Underlying Sound

Given the widespread equation of sound and letter in certain cultures, it is theoretically conceivable that in a few set phrases (e.g., in acoustically slanted similes) names of letters evocative of sounds might occur as welcome frames of reference. One can imagine, savored in isolation or arranged in sets, stereotyped comparisons of the type: ⌜shriller than an *I*⌝, or ⌜dull as an *O*⌝, or ⌜hissing like a [s]⌝, or again ⌜no less flat than a [...]⌝, etc.

In the introductory section of his recent monograph (see fn. 12, above) I. Fónagy has arrayed numerous cross-cultural testimonies on the use, from times immemorial, of impressionistic qualifiers in the classification of sounds: thin or sharp vs. thick, light or brittle, fragile vs. heavy, weak or empty vs. strong, clear vs. dark (or murky), straight vs. skewed, high vs. low, narraw vs. broad or flat, acute vs. obtuse, white vs. black, cold vs. hot or steaming, delicate vs. rough, quick or nimble vs. slow, and even male vs. female. Understandably, his authorities have, for the most part, been grammarians and teachers of diction (in some corroborative tests his own children have acted as "subjects"); [42] Dante appears briefly as a witness (p. 23) for the existence of soft, woolly, gliding, smooth, and hairy sounds—but it is Dante the theorist rather than the practicing poet that has been appealed to. If the inquiry were to spill over into the adjoining domains of *belles-lettres,* folklore, and untutored laymen's reactions (where pertinent material, precariously dispersed, can be assembled only through chance discoveries), there is a high probability that the slot here posited through logical extrapolation might effectively be filled.

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and cattle (also, less generally, sheep). The simplest brands are ordinary letters, usually paired off (*CB, RL*). Quite frequently the shapes of the letters are altered. The most common deformations are achieved by combining two letters into one character (ꓤ ← *JB,* ꓠ ← *NL*) [these ligatures are reminiscent of Arabic script]; a common var. involves the reversal of one member of a set (ꓔ ← *BL,* ꓥ ← *KB*). Occasionally one letter will absorb another: ꓓ ← *DK;* but Ⓟ would be interpreted 'Circle P' (see below). Many brands are formed by letters accompanied by qualifying or distinguishing signs, e.g. Ꭺ, Ⓐ; these qualifiers have conventional names, and such brands are «read»: Ꭺ 'Rocking A', Ⓐ 'Diamond A'. Further variation is achieved by «resting» a letter on its side (⊻), whereupon it ranks as 'Lazy'. Some combinations are quite intricate".

[42] Few went as far in embroidering as F. Cascales who, in his *Tablas poéticas* (1617), called *p* "soberbia e hinchada" and *u* "sutil y lánguida."

Puns on the Label of a Letter

In some instances, we recall, the conventional name of a letter (as used in spelling-out a word, say; also in reciting the alphabet), or at least its "peak," approximately coincides with the acoustic value of the phoneme so designated; cf. the tags of the vowel phonemes in such languages as German, Russian (except for ы), Spanish, and Italian. In other situations the label attached to the letter is discernibly different from any correlated sound effect; note especially the discrepant designations of the *H* in the major European languages (It. *acca,* Fr. *ache,* Sp. *hache,* Ptg. *agá,* etc.). In characteristic Semitic alphabets, particularly in the Hebrew, the name for each consonant pillar and each diacritic sign or vowel symbol is a full-bodied word which, more often than not, is endowed with some primary meaning, hierarchically far weightier than its derivative orthographic meaning; e.g. H. *'ajin* 'eye' (and sign for a pharyngeal consonant), *jad* 'hand' (and sign for a prepalatal semiconsonant). The situation obtaining in the Greek and the Old Cyrillic alphabet (as used for Church Slavic) is partially reminiscent of Semitic (Phoenician) so far as the length of the labels—as distinct from their partially voided semantic (in particular imagerial) content—is concerned. Both kinds of label, the natural or sound-imitative and the conventionally autonomous, enter occasionally into word-plays, in rebus fashion. In cultures exploiting humorous situations —to produce the impression of informality, light touch, extemporaneousness, originality, gaiety, banter, irrepressible naughtiness, persiflage aimed at all that seems stale and stuffy—this flashy device is effectively harnessed in ticketing fancy food items, unconventional ("exotic") types of entertainment, all such services as appeal to the customer's unashamed hankering after modernity and escape from normalcy: *Bar-B-Q* ← *barbecue, The hungry i* (name of a San Francisco night club famous for its daring floor show, with *i* standing—one guesses—for [ogling] "eye" or—so legend has it—for "intellectual," with a possible side-glance at "I" 'ego,' while the lower-case letters are impudently thrown in for additional shock), *U-drive* and *U-haul* (two recent manifestations of the "do-it-yourself" fad) beside less sharply silhouetted *U-save* (supermarket), etc. Particularly amusing, on account of the built-in chain reaction of surprises, is *U-Smile* (name of a motel outside Kansas City, Mo.) which, on further thought,

resolves itself into *U.S. Mile.*[43] Semihumorous in background, perhaps, and reminiscent of *X* for 'extension' is the salesman's abbreviation *XL* ← *extra-large,* in reference to men's shirts; this particular symbolization of size by letter clashes with the following use of (a) one series of a given letter: *AA, A* (for eggs), *AA* through *EE* (for shoes) and (b) one series of letters: *A,B,C,D* (for men's pajamas).

Whatever one may think of the latter-day commercialization of these jocular elements, their primary use in comic rhymes, riddles, parlor games, anecdotes, etc. is unassailable. Of the many examples that come to mind let me adduce just two. In the 'forties the following comic rhyme swept this country: *ABCD goldfish?* ('Abie, see de [= the] goldfish?')—*LMNO goldfish!* ('[H]ell, [th]em ain' [n]o goldfish!') —*OSAR goldfish* ('Oh, [y]es, [th]ey are goldfish').[44] The other illustration immerses us in a multilingual milieu. Yiddish, in its basic layer an alloy of German dialects but one imposing on its users—all of them literate—familiarity with the Hebrew alphabet, represents a patch of unsurpassably fertile ground for all kinds of cross-cultural puns. To appreciate the joke one must remember that G. *Heu* 'hay' corresponds to Yid. /he/, which the letter *H* happens also to be known as /he/, in Semitic tradition, as against standard G. /ha/. The story itself is short enough: An avaricious Jew is reported to have fed his donkey a gradually diminishing daily ration of hay until, at the bitter end, he offered him, instead of any food, a complimentary glimpse of *H* in a Hebrew primer.

[43] In this twilight zone one may also place the spelling "eye" for the letter "i," which, as a result of its intrinsic palsy, suffers from poor visibility. In many cities with "alphabet streets" (e.g. Washington, D.C., and Sacramento, Calif.), the *I Street* appears as *Eye Street* on maps and some streetsigns. Through further, less justified extension of this principle, a bifurcation in a California road or highway may be referred to as a *wye;* thus, the Y-shaped junction of a well-traveled East-West "cut-off" with the north-south highway a few miles to the south of Napa is known to motorists as the *Napa Wye.*

[44] The supply of rebus-like jokes and riddles is, of course, inexhaustible. The former category may be further illustrated with *YYUR/YYUB/ICUR/YY4me* ("Too wise you are,/too wise you be,/I see you are/too wise for me"); the later is aptly exemplified with the question: "Which five letters may form a sentence of forgiveness?", prompting the answer: *IXQSU* ("I excuse you"). Half a century ago, Latin American adolescents drew much inspiration of this kind from H. Pipiritaña, *Media tonelada de chistes;* the German-speaking countries have their own supply of *Witzkisten,* and a veritable subliterature has sprouted the world over.

Interactions of the Separate Functions

After categorizing as neatly as possible the secondary uses of alphabetic letters in actual language, one is led to revert to the question: Is it possible to identify combinations of these functions or overlaps between them? The answer is in the affirmative. (Because there have been all along incidental hints to this effect, a measure of repetition is unavoidable; but a concluding restatement has its justification.)

Several rather different situations come to mind. Hypersensitive persons (such as poets), who have been cultivating experiences in synesthesia, are apt, I suppose, to establish connections between the graphic thinness of an *I* and a certain phonetic thinness (or shrillness) of the corresponding sound [i], or, for that matter, between the roundness of an *O* as a letter and the rounding of the mouth in the pronunciation of [o], if not of [ɔ]. Such sensory cross-connections involving the interplay of the third and the fourth use retain their validity in art and have exerted a modicum of tolerable influence on learned nomenclature, but are unlikely to affect the humbler forms of speech.

A speaker's leaning toward acronymic abbreviation, on the other hand, may very well be paired off with his preference for granting autonomy to short segments of the alphabetic array. Characteristic of ultramodern trends, particularly in the English-speaking world (ironically, also in the Soviet sphere and in Israel), is in fact the selection of such abbreviatory slogans, titles, and names, especially for aggressively marketed brands and for dynamically fostered movements, as lend themselves either to conspicuously easy memorization or to strikingly effective enunciation (best of all, to both). Whereas previously an infectious sequence of catchwords was first launched on its own merits and only then was the wisdom of some kind of space-saving abbreviation separately tested, the stage reached at the mid-century point demands that in preliminary deliberations about catchwords, at the very moment of their "incubation," the optimal advantage to be derived from the impact of their prospective compression be allowed to intervene as a prime determinant of the final choice. The three best mnemonic devices available in the Western World are (a) either to arrange the acronym in such manner that it may convey, in capsulized form, an appropriate message of its own; cf. the appeal of such richly suggestive neologisms as R. *MIG* (name of a

military jetplane) 'eye's wink, moment,' *CARE* and *CORE* ← *Congress of Racial Equality,*[45] as against the colorless, linguistically indifferent *AFL, CIO, HUAC*, etc. of earlier vintage (to say nothing of *RENFE,* the uninspiring name of Spain's national railway company, and of downright cacophonous *SSSR*); (b) or, by way of alternative, to array the letters in sequential order, as in California's (and other states') *ABC* Agent, vividly calling to mind the "Alcoholic Beverage Control Act"; (c) or else to achieve a striking monochromatic effect through repetition: *BBB* ← *Better Business Bureau.* Where meaningful authentic words fail to crystallize, there remains the residual possibility of the emergence of such acronyms—bordering on works of art—as suggest names hauntingly beautiful and at the same time not implausible, e.g. *EUDEBA* ← *E(ditorial) U(niversitaria) de B(uenos) A(ires).*[46] Of these various techniques it is clearly *ABC* alone that illustrates an overlap between the first and the second function.

Of the exceedingly rare interlocking of the first and the third use no other example is on hand but *Mind your p's and q's!* If the anecdote tracing the formula in *Mind your pints and quarts!* is based on ascertainable historical fact,[47] the dual motivation, pictorial and

[45] Additional examples: Am. E. *CATS* ← *Children's Amateur Theater Service; FLIC* ← *Film Lovers' Independent Cinema (Society)*, with a hint of coll. *flick* 'motion picture,' both organizations with headquarters in San Francisco (1965); G. *ODESSA* ← *Organisation der ehemaligen SS Angehörigen,* with the name of a Russian seaport beckoning—as a haven of safety, a dream-like avenue of escape, or a nightmare of remorse? From Italy I can report *FIAT* (with Biblical reverberations) ← *Fabbr. Ital. Aut. Tor.* and *UNICA* ← *Unione Nazionale Italiana Caramelle (e) Affini.* A rebellious student movement might gather more than ephemeral strength if the surging defiance were first expressed by the organization's threatening full name, then epitomized and driven home, in punch-line style, by a hard-hitting acronym (say, *FIST* ← *Free, Independent Students for Turmoil*).

[46] Ever new such deceptively euphonious, "romantically" sounding names seem to be crystallizing. The latest that has come to my attention is *ARAPA* ← *American Research And Professional Association* (Berkeley, Spring 1965). Linguistically relevant is the fact that, to increase the percentage of vowels and thus to enhance the audio-oral attractiveness of their brainchildren, the engineers of formulas currently pepper them with *o*'s (from *of*) and *a*'s (from *and*), cf. *CORE.* Contrast this practice with the older strict confinement to the nuclear words, as in *AFL* ← *American Federation (of) Labor and CIO* ← *Congress (of) Industrial Organizations,* where *of* is left unrepresented.

[47] Derived from the manner of serving beer in English pubs (16th-17th centuries). One had to "mind" the *p*'s and the *q*'s, because they were marked on a board, and the customer paid later by the number of marks.

sequential, of the contrast $p : q$ would explain the immense appeal and rapid speed of an initial tavern joke.

The following combination of uses may be unprecedented. Dartmouth College sponsors a summer educational program for underprivileged children called *ABC ← A Better Chance*. The abbreviation conjoins two varieties of the first use: the vivifying sequential effect and the topical suggestion of the program's actual goal: imparting the "ABC" (and its implications) to children.

In the past, some linguistic scientists have gone out of their way to stress the derivative character of script as against speech.[48] It was probably wholesome or even necessary to drive home relentlessly the distinction in rank; but once the point has been made, it is equally wholesome to remind ourselves that, tape, phonograph record, radio, and television screen notwithstanding, one can observe a present-day global trend toward increased "old-fashioned" literacy. To this rational curve has been superadded, as a discrete feature of style, the fascination for the abstract and distilled. The chances are that, riding the combined crest of these two vogues, the names, sounds, shapes, and successions of letters (the last-mentioned in small segments of the alphabet and in either crude or sophisticated abbreviatory successions) will play a progressively influential part in the phraseological contour and in the lexical deposit of all languages whose speakers resort to alphabets.[49]

[48] No expert has taken a more uncompromisingly vigorous, indeed, rigid stance on this matter than the late L. Bloomfield; see my review, in *RPh,* XVI (1962–63), 83–91, of his posthumous book *Let's Read; a Linguistic Approach* (1961), ed. C. L. Barnhart, with special reference to the Introduction. My own stand on this score coincides, by and large, with D. L. Bolinger's ("Visual Morphemes," *Lang.,* XXII [1946], 333–340), who spoke up courageously at a moment when it was almost hazardous to do so; see especially his remarks on "Visual paronomasia": visual puns, intentional misspellings, and other non-phonemic signs, such as dashes, quotes, spacing-out (pp. 337–339).

[49] I owe certain data and ideas to my late wife, María Rosa Lida de Malkiel, and to a number of friends: R. D. Abrahams, A. L. Askins, Rina Benmayor, D. Catalán, O. Elizabeth Closs, Louise G. Clubb, P. B. Fay, W. E. Geiger, V. Golla, J. L. Grigsby, Henry R. and Renée T. Kahane, Raimundo and Denah Lida, Marilyn May, Josephine Miles, Arshi Pipa, M. J. Ruggerio, G. A. Shipley, R. Stefanini, A. Taylor, E. Vihman, Alina and Elizabeth H. Wierzbiańska, B. M. Woodbridge, Jr. See also fn. 30, above, for a special acknowledgment to Mr. Michael J. Toconita.

There are several side-issues into which limitations on space have prevented

me from going. One rewarding direction might have been the study of commercial brand-names; Leo Spitzer's Smith College lecture of February 19, 1948 ("American Advertising Explained as Popular Art"), included one year later in his book *A Method of Interpreting Literature* (pp. 102–149), is quite unenlightening on this major facet of the chosen "Gebrauchskunst."—The jocular expansion of abbreviations, briefly hinted at in fn. 24, actually represents an autonomous "secondary use," because it interposes between two full-blown word groups a mediating literation of implicitly equal rank; cf., in the parlance of American military advisers stationed in Vietnam, *Viet Cong* → ***V.C.*** → *Victor Charlie*. The motivation is not necessarily jocose; superstition, pooh-poohing, and still grimmer attitudes may be behind this "verblümter Ausdruck."—Regarding the use of Latin *N*, in Cyrillic environment, for 'X' by Russian classics, note that Gogol, in veiling the locale of his narratives, wavered between *NN* (*Dead Souls*, opening line) and raised triple star, thus: *po ulicam sela****, to which he even dared attach an adjectival suffix: *** *skoj cerkvi* (*Evenings . . .*).

Commentary: Methodological Problems in Research on Simplified Alphabets and Regularized Writing-Systems

John Downing

Two major criticisms may be made of Edward Fry's article (6) in the January, 1967, issue of *The Journal of Typographic Research*: (1) a major fault in the design of his research; (2) a serious underestimate of the problems of transfer from one writing-system to another. Besides these, there are some minor errors of fact which will be pointed out in footnotes.

1. *A Major Fault in Fry's Research Design*

Fry tells us (p. 20) "the real problem is: Will some system of improving the phoneme-grapheme relationship increase the efficiency of a child or adult learning to read. . . ." To answer this question Fry compared children learning a system of improved phoneme-grapheme relationships (either his Diacritical Marking System[1]—"DMS"—or the Initial Teaching Alphabet[2]—"i.t.a.") with other children learning the more irregular traditional orthography ("t.o.") of English. But Fry's critical test was *not* one of reading in the writing-system which the children had learned. Instead, after only 140 days, all the children were tested in the t.o. writing-system, which was taught to only one of the groups. The sur-

[1] The seventeenth-century inventor of a system of diacritical marks for beginning readers was *Richard* (not "John," as stated by Fry) Hodges (9).

[2] The initial teaching alphabet (i.t.a.) devised by Sir James Pitman has more than "16 new characters" as stated by Fry. I.t.a. has a total of forty-four distinct characters, made up of the conventional lower-case roman alphabet except *q* and *x*, plus twenty other characters. A full description of i.t.a. is provided in Downing (1).

prising result was that the i.t.a. and DMS children could, after such a short period of learning either i.t.a. or DMS, read t.o. as well as the t.o. pupils, who had been learning t.o. systematically and continuously from the beginning, but Fry concludes, "It does not make much difference which method is used to teach beginning reading" (p. 28). Fry does admit on the third page of his description of the experiment and its results that "It is worth noting that the Stanford test used was the regular test, that is, it was printed in t.o. Only about half of the DMS children and a little less than half of the i.t.a. children had formally 'transferred' to t.o. materials" (pp. 27–28).

Fry's conclusion in the preceding quotation then follows at the foot of the same page! This obviously false conclusion is a consequence of a serious error in research design which in turn arises from Fry's confusion between variables *on different dimensions* in reading. For instance, research on basal readers as compared with individualized reading could be on the dimension of the *language-content* of the instructional materials. Because i.t.a. is a writing-system, the only legitimate comparison that can be made in evaluating i.t.a. is between the i.t.a. writing-system and some other writing-system for English (e.g., t.o.). Thus, it is quite meaningless to compare i.t.a. with a basal approach, as did five of the twenty-seven U. S. Office of Education First Grade investigators referred to by Fry. Hahn (8), for example, compared i.t.a. with the language-experience approach and the basal reader approach. But these cannot be compared because they are on different dimensions. For instance, you can teach the language-experience approach using the i.t.a. writing-system or the t.o. writing-system, and you can use basal readers printed in i.t.a. or printed in t.o.

This same basic confusion of the dimensions of reading research variables which is apparent in Fry's treatment of i.t.a. as a "package deal" leads to a second serious error. This is his failure to control the variables on the other dimensions. In comparing one approach with another it is essential to make sure that all major dimensions and factors in reading are controlled except the one being investigated. The contrast to be made is between i.t.a. (or DMS) and t.o. Therefore, in the i.t.a. classes and the t.o. classes in a research project everything else of significance in reading should be as nearly as possible the same. But in almost all the i.t.a. researches currently being conducted in America one major variable has not been equated in the i.t.a. and t.o. classes. This is the actual

language content and methodology of the reading program. For example, Fry (7) in his own experiment compared i.t.a. with his Diacritical Marking System (DMS) and the Sheldon basal reader series in t.o. The DMS materials were the Sheldon Readers with the print altered according to the DMS, but they were not identical with the t.o. series, because they were sub-standard in their lack of color in the illustrations. What is much worse, the i.t.a. materials were not the Sheldon Readers printed in i.t.a. but an entirely different basal series by Mazurkiewicz and Tanyzer. Thus, not only were the writing-systems different, but also that major factor—the content and methodology of the teaching materials—varied too, and, therefore, one cannot tell whether any differences that are found (or any failures to find differences) are caused by the writing-system variable or by the materials variable. This meaningless comparison is made worse (if that is possible) by the fact that the i.t.a. basal series by Mazurkiewicz and Tanyzer is not only very different in content and methodology from the Sheldon Series but it is also very different in content and methodology from any of the other major basal series in i.t.a. Thus, it is not even representative of i.t.a. basal series in general.[3]

Fry actually admits (p. 26) that the Initial Teaching Alphabet special beginning reading series, written by Mazurkiewicz and Tanyzer has "more of a phonic and language experience approach (emphasis on children's writing) than the Allyn and Bacon series." Here some conflict of opinion between Fry and other reading experts should be noted. His assessment of the unusual emphasis on phonics fits other reviews[4] of the Mazurkiewicz and Tanyzer readers. For instance, Ohanian's (10) independent analysis of this i.t.a. series describes it as "unmistakably a phonic approach," but her description also conflicts with Fry's evaluation. She says, "*Though it is possible* for teachers to construct language experience charts using the above symbol-sounds in word wholes, clearly the focus is *not* on teaching word wholes . . .", and "The mode of teach-

[3] For a detailed criticism of the methods and content of the Mazurkiewicz and Tanyzer *Early-to-Read* i.t.a. series, see Downing (2).

[4] But Sheldon (personal communication) comments on Fry's comparative evaluation of his (Allyn & Bacon) series: "A careful analysis of our reading program reveals a complete phonics program beginning at the readiness level. As for the emphasis on children writing the Activity Book and Independent Activity pads, as well as countless directed lessons, focused in our manuals, indicate a heavy emphasis on the development of writing skills."

ing and learning is largely through telling or being told respectively, and *much less through guided discovery.*"

In all the British experiments on i.t.a., one basal series (*Janet and John,* by O'Donnell and Munro) has been used in *both* the i.t.a. and the t.o. classes. Both versions—i.t.a. and t.o.—were identical in format and content, thus ensuring the same quality of production for the experimental and control groups. Therefore, any differences found can be attributed with greater certainty to the change of writing-system. This plan is being followed also by Helen Robinson at Chicago and by Jack Holmes in California. In their studies they are using i.t.a. and t.o. editions of the Scott Foresman basal series which are identical apart from the change of writing-system. Andrew Taylor at the University of Ibadan in Nigeria is also using this scientific approach of having identical series in i.t.a. and t.o. for the experimental and control groups.

Many other studies (such as Fry's), however, have failed to control this variable,[5] and it will, therefore, necessarily be impossible to evaluate the effects of i.t.a. as compared with t.o. in such experiments.

Failure to appreciate that the i.t.a. experiments are concerned solely with the writing-system dimension also leads Fry (as it has others) to use inappropriate criterion tests. Because he sees i.t.a. as a total "package deal" or "method" of teaching "reading" he assumes that the only possible object of an i.t.a. experiment can be reading *in t.o.* (i.e., the goal of teachers who begin normally with t.o.). But the truth is that reading is still reading, whether it be in i.t.a. or in t.o. What we want to know is—do the complexities and irregularities of t.o. (in contrast to a more simple and more regular writing-system such as i.t.a. or DMS) restrict children's access to the English language in print? To find out the answer we must not only teach the i.t.a. students in i.t.a. but *we must test them in i.t.a.* The only valid way to tell whether i.t.a. makes printed English more accessible to young beginners is to use the same sample of the English language for teaching i.t.a. students as we do for teaching t.o. students (e.g., the same basal series in i.t.a. as in t.o.) and then to test both the i.t.a. students and the t.o. students on identical samples of the English language printed in i.t.a. for the i.t.a. students and in t.o. for the t.o. students. This was not done by Fry, and therefore we cannot tell from

[5] Hahn used a more representative i.t.a. basal series—but the t.o. pupils still had different instructional materials.

his experiment what are the effects of simplifying English orthography by means of either i.t.a. or DMS.

2. *Transfer Is Not a "Sham Problem"*

Another misleading conclusion in Fry's article arises from his method of observations. Instead of rigorous test procedures, he used "informal observations" (the phrase is not defined), and this leads him to believe "that transfer is somewhat of a sham problem for both DMS and i.t.a." (p. 28). The recently published report (Downing—3) on the British experiments with i.t.a. includes the results of objective tests of transfer from i.t.a. and t.o. which show that Fry's generalization may be dangerously misleading to teachers who may use i.t.a.

The truth of the matter is that transition from i.t.a. to t.o. is a more complex process than appears to have been envisaged originally. For example Sir James Pitman (1) said that in i.t.a. the Monotype Corporation "have left almost undisturbed what might be called the 'top coastline' of words and sentences," and he proposed that this would lead to easy transition once the child "has become familiar with word-forms, and is no more than glancing at the print—and then only at the 'top coast-line' of it." The British i.t.a. research report states that, although subjective impressions indicate that transition from i.t.a. to t.o. (for the average child at about the end of the second year) is "painless," nevertheless the objective test results show that children's reading attainments in t.o. drop below their i.t.a. attainments for about six months. By the end of the third year the i.t.a. students' recovery from this setback gives them a significant advantage in their t.o. reading, as compared with the pupils who have had t.o. from the beginning, but even so we need to be very much concerned about the causes of the plateau or even regression that occurs in the development of literacy skills at the stage of transition from i.t.a. to t.o. So far, our investigations suggest that i.t.a. students do not transfer in units of whole-word configurations (as Sir James Pitman seems to have expected), but instead a smaller unit needs to be considered. When we study i.t.a. students' errors in reading t.o., it becomes clear that some difficulties are being caused through sources of proactive interference in i.t.a. A detailed discussion of these results of the research on transfer from i.t.a. to t.o. is being published in Downing (5). There it is proposed that "urgent consideration should be given to . . . a series of laboratory studies to shape the new system to provide

greater effectiveness in transfer to reading and writing in the conventional orthography of English."

Thus transfer of learning from i.t.a. to t.o. is far from being a "sham problem." If one is interested only in i.t.a.'s longer-term effects in transfer to t.o. (Fry's reluctance to test in i.t.a. or DMS suggests that this is his real position) then it must be stated that the consensus of the objective research evidence to date shows that i.t.a. appears to be a promising innovation, but if its promise is to be fully realized further improvements in the i.t.a. writing-system itself will need to be made after appropriate empirical tests in further research. Some of the problems which may face designers who wish to attempt to improve i.t.a. are discussed in a recent article in *Phi Delta Kappan* (Downing—4).

If, on the other hand, one is interested in the effects of "improving the phoneme-grapheme relationship" in English orthography on the accessibility of the English Language to the reader (which Fry says is "the real problem"), then i.t.a. must be recognized as very much more than just a promising idea. The effects of i.t.a. in developing literacy in English are very considerable. For example, the British research found that after one and one-half years of learning i.t.a. the average pupil could read more than twice as many English words in i.t.a. as the pupil brought up on t.o. could read of the same samples of English printed in t.o. Therefore, although it is in direct contradiction to Fry's opinion, the conclusion from the British research, published in *The i.t.a. Symposium* by the National Foundation for Educational Research in England and Wales, seems reasonable: "The unequivocal conclusion from the results of these experiments is that the traditional orthography of English is an important cause of difficulty in teaching and learning reading and writing in English-speaking countries. So long as t.o. is used for beginning reading and writing one must reckon that children are more likely to become confused about the tasks of reading and writing than they would be with a more simple and more regular system for English."

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A Reply by Edward Fry

One of the main criteria of a science is that the results be replicable. If a statement is true in Kansas, it should also be true in London and Pennsylvania, given reasonably similar conditions.

The chief problem with John Downing's statements about i.t.a. is that other people do not seem to be able to replicate them. For example, in 1963 Downing told the International Reading Association, "We have recently tested all the experimental i.t.a. pupils in seven classes on their ability to read *the conventional alphabet and spelling,* although not more than 40% of them had been taken off i.t.a. books by their teachers at this time. . . . The most important fact which emerges from these tests is that the i.t.a. group achieved significantly higher scores for accuracy in comprehension in reading the *conventional alphabet and spelling*" (1). [Downing's italics.]

Now, when I do not find this and neither do five other investigators, Downing complains of faults in our research design. Table 1 shows the

TABLE 1: *Stanford Achievement Test Paragraph Meaning Raw Scores of Studies Comparing i.t.a and t.o. Taught Populations after 1 Year of Instruction*

Study	*i.t.a.*	*Basal t.o.*	*N*
Hahn—Oakland, Michigan (6)	21.5	20.9	885
Mazurkiewicz—Lehigh (10)	20.6	21.1	730
Hayes—Pennsylvania (7)	21.0	19.8	365
Fry—Rutgers (3)	17.6	20.4	393
Tanyzer—USOE Study (15)	23.1	16.4*	656
Tanyzer—N.Y. State Study (14)	21.4	21.4	102

*Sig. .05

results of five studies which do not confirm his statement. Downing, ignoring his own pronouncement, states that we are at fault for not testing i.t.a.-taught children in i.t.a. However, the better answer for that statement is simply to wait until all children have transferred out of i.t.a. and

then to test them in regular print. As far as I know, there are no tests standardized in i.t.a. (merely transliterating tests and applying regular norms is dangerous). Since the testing for my article in *The Journal of Typographic Research* (5), I and other investigators, Mazurkiewicz (9) and Monson (12), have reported test results at the end of the second year, and there is still no difference. In fact, I have seen, though not yet published, my mid-third year results and there is no difference.

It certainly would be superior to have a better controlled experiment with exact translations, but we were unable to do this. I hope that the experiments by Holms and Robinson will be completed soon. But I would like to note that all of the U. S. studies did not use the Mazurkiewicz and Tanyzer materials. One of the investigators, Hahn (6), used a set of readers written by Downing, and the test results did not show them to be superior to traditional readers.

Whether or not transfer from i.t.a. to regular readers is a problem as Downing claims, or not much of a problem as I claim, is of minor importance. Most research reports are beginning to tell us that most people will not be using i.t.a. anyway.

As for Downing's final quotation that "Unequivocal conclusion from the results of these experiments is that the traditional orthography of English is an important cause of difficulty in teaching and learning reading and writing in English-speaking countries," perhaps that statement was written some time ago, as certainly it does not jibe with most current U. S. research, or even with the research of Terence Swales at Reading University (England), who after a three-year study comparing i.t.a. and regular readers concluded that "Children taught by i.t.a. for three years were neither superior nor inferior in reading achievements to those taught by t.o. (traditional orthography) from the onset" (13). Like the U. S. studies, he did not find any differences favoring i.t.a. for boys or girls, or favoring i.t.a. for bright or dull pupils.

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Correspondence

The editors welcome comments on articles, reviews, and letters that have appeared in the Journal. Communications should be addressed to the Editor, c/o The Cleveland Museum of Art, Cleveland, Ohio 44106.

Legibility of Reversed Print

An old friend from Boston (David A. Yuill, who died at the age of 90 a few weeks ago) was visiting with me about ten years ago. He had been having trouble with his eyes for some time—cataracts, if I recall, and arrested glaucoma. In any case, he commented that it was much easier for him to read "reverse" printing than black on white. It has been suggested here that when one of our people is over-tired, the background of the printed page "seems to recede" so that in effect a person is reading the black holes in a printed page. We pointed out that this was substantially what the eye did altogether, in much the same way that the camera photographs the white background on a printed sheet, with "holes" for letters. We agreed that if the background of a "reverse" were to recede in similar ways, the letters would seem to stand out more. In any case, we tried Mr. Yuill with numerous samples—including lithographic negatives, especially on a light table. He was able to read them very easily, particularly any good gothic type and almost any size. If there is anything to this, I would hope we could call if "Daysight" or otherwise acknowledge him. It should be possible with some very simple experiments to see if this has possibilities for the visually handicapped. If it does, the techniques for implementing it are so very simple. . . .

A second point: When we want to heighten readability in any questionable copy situation, we enlarge to 101%, 102%, 103%—not more than 105%. The improvement in readability is fantastic. This is a very simple photographic procedure today, and might provide a very inexpensive means of making conventionally prepared material easier for the "hard-of-seeing" group to utilize.

M. Tanenbaum, 1710 West 25th Street, Cleveland, Ohio 44113

Mr. Tanenbaum raises an interesting point. Some years ago I experimented with reversed (negative) print, and found it somewhat inferior to ordinary print. We had all kinds of good reasons for anticipating this and for explaining it, but all our subjects were normal. This letter made me do some more thinking, and I believe it might be well to repeat experiments with subnormal subjects for the following reasons:

(1) Elderly pathological conditions often produce a great deal of light-scattering material within the vitreous of the eye, and a reduction of the light background could well help these people. I have found *light* reduction sometimes does. On the other hand, many others benefit by increased reflectance, or illumination.

(2) This would undoubtedly be an individual thing, common to only certain people; but I can conceive pathological conditions in which the subjects would respond positively to a reduction in reflectance in the same way as we respond to an increase. Ordinarily, white print on a black ground produces halation around the letters, thus reducing their legibility. In situations where there is great light scatter (with the same effect as halation) within the eye, negative print could well be less confusing than ordinary print. I really think someone should work on this after all!

I may not be right in all these instances, but the people I would imagine could derive benefit in such experiments would be those with diabetic retinopathy, cataract of a diffused nature, all forms of intraocular opacity in small particles, and any diffuse retinal degeneration such as comes with senility. The experiments would have to be conducted with variable illumination also, because I suspect that negative print might well require high illumination; but, on the other hand, this might even defeat its purpose. As I said, cases might prove individually different in their responses.

So far as Mr. Tanenbaum's mention of photographic enlargement of print is concerned, this is, of course, how large types are now derived from standard books, and how all those which are on the market at present are made. The quality of the paper is often better in this procedure also—greater reflectance, smoother surface, etc.

Mr. Tanenbaum should be encouraged. If he wants to do any experiments with negative print, he should be quite sure that he has identical print in positive type for comparison. The whites and blacks should be of the same reflectance, and the print size exactly the same. Then the experiment could be extended to take in types of different sizes—the negative larger than the positive, for instance; and it might be possible to get some meaningful data in time. Halation in the printing process would have to be accounted for also; microscopically, in fact.

Jack H. Prince, 26 Moore Street, Clontarf, N.S.W., Australia

Miles A. Tinker, *Bases for Effective Reading*. Minneapolis: University of Minnesota Press, 1965. Typography by M. A. Tinker. 322 pp. $7.50.

"The aim in writing this book has been to present a clear, simple, and well-co-ordinated exposition of available information on the reading process which is so fundamental to most of our daily activities. Much of the research reported here was carried out by the author during his thirty-two years at the University of Minnesota. Materials from related research by others have been added to provide a comprehensive picture of the areas covered. . . . It is hoped that the material in this book will promote among both teachers and research workers an adequate understanding of what is basic for effective reading."

In his introduction, the author makes it clear that he is well aware of the fact that "Any attempt to make a complete list of the aspects basic to an understanding of the reading process doubtless would be unrewarding since a consensus of the experts is most unlikely. However, it is probable that the following partial list would be accepted by practically everyone in the field of reading"—and then proceeds with a brief commentary on his table of contents.

Now, there is little doubt that teachers and junior research workers will find here a mass of reliable and valuable information concerning a series of psychological factors relevant to the reading process. Yet the difference in Professor Tinker's attitude towards teachers and his attitude towards expert typographers cries out for objection. While the current methods, opinions, and practices of teachers are implicitly and explicitly accepted as sound, as expert and beyond any question; all typographers *en bloc,* whether expert

or not, are presented merely as introspective aesthetes deserving, on the whole, of contempt (pp. 115, 125, 135, 136, 183). This is a pity.

It is hardly necessary to point out that no profession, as such, should be open to this kind of disparagement. It serves no thoughtful purpose, and it is hardly commendable to encourage such an attitude with all the weight of a long experience in a position of some scholarly regard, when co-operation and mutual understanding should be fostered—especially in a project of this kind—between (expert) teachers and (expert) typographers. It is a fact that primers and textbooks propose particular and severe problems of design, and a spirit of co-operation is all the more to be expected since, *pace* Professor Tinker, publishers and printers alike are more and more relying on the expert knowledge of typographers as designers. Expert typographers in fact do exist, and it is only fair to add on their behalf that there is little if anything in Professor Tinker's exposition that goes to counter their theories or practice. Indeed, it is a matter for regret that the author, who is also the typographic designer of his book, did not deem it worth his while to explain how it comes to be that his "scientific" typography so much resembles many other "merely" typographic designs present in the current book production on the continent as well as in the U.S.A. This is not to say that all books are well designed or that Professor Tinker's book is not a good example of Aldine sobriety.

It would be invidious to dwell on what may be considered minor contradictions within the author's jibes at expert typographers and his own conclusions which, as already stated here and elsewhere, run parallel to common typographic practice. But there is every reason to point to one particular remark he makes (p. 41): "In general, there has been an overemphasis in the classroom on speed of reading as such." In the classroom, indeed? What then shall we conclude from the fact that the phrases "speed," "eye movements," and "photographic measure of reading" appear literally in eighty-eight out of 356 titles listed in the bibliography, and in twenty-four of Professor Tinker's own contribution of seventy? The word *design* is nowhere to be found.

Further (pp. 109–110), Professor Tinker states: "All well-designed experiments which have attempted to evalute the role of training eye movements to improve reading have failed to find that such training is either necessary or desirable. . . . This training may also result in a decrease in the flexibility and adaptability of reading habits which characterize good readers." Lastly (p. 129): "Type faces in common use in 1932 [when shall we know—experimentally, scientifically—about common use in 1967?] do not differ significantly."

Unless this reviewer is badly mistaken, all this suggests that the consistent

employment for nearly a century of any number of type designs (whose legibility, by the way, has eventually been tested by secular acceptance), with the assistance of any number of willing subjects and any number of instruments, has at long last been shown to lead headlong into a blind alley.

It should be clear by now that letter styles, single and combined, in manuscript (for two millennia) and in print (for five centuries) have varied endlessly in the course of time and over the various geographical and political areas. Yet there has been little concern about their relative legibility or illegibility.

Let us say that research has made it clear that legibility and readability are mainly a matter of spacing, leading, position, and margins; in short—of layout, of design, of space organization or "topography." Far less, if at all, a matter of type design.

Does this mean that type design can be altogether overlooked? Of course not; far from it. Much can be done in the future with Dr. Bror Zachrisson's concept of *congeniality*. By definition, it cannot be applied to type or lettering, as such, in a vacuum for it implies a designed context. Our modern conventions in this respect might prove rather loose when compared with historical models. Therefore it would be more than a matter of mere antiquarian or historical interest to investigate the extent of integration, consistency, and complexity to be observed in various design conventions and in various kinds of documents, chosen according to a plan covering different periods (not excluding the contemporary scene), nationalities, social groups, occupational interests, religious affinities, etc.

It would become all the more evident not only (as some typographers and most palaeographers have known since time immemorial) that almost any letter style or "font" is sufficiently legible as long as it is consistent; but also that otherwise perfectly illegible forms become acceptable and *are* accepted, without being "read," from the very moment that they are congruent with a living convention, e.g., the *invocatio,* in compressed lettering, of thousands of mediaeval diplomas. Anything improper or unusual, however legible it might be, would probably cause the document to be rejected by those for whom it was intended. Thus, far from looking any longer for insignificant degrees of legibility in any number of letter styles, research could be directed toward an understanding and appreciation of the congeniality of type groups or type *constellations*. For that is precisely what the concept of congeniality invites: the notion that writing or type must not be considered separately but rather as part of a whole, of a particular design or a more or less conscious convention. "Constellation" would then apply to any group of letter styles generally combined in an accepted convention, e.g., Tours, IXe AD: roman caps, rustica, uncials, caroline.

In short, the time has come for those who conduct research into the legibility of type to consider the fundamental question of *what* ought to be the next subject for their experiments. This reviewer suggests that *design* should be the object of further psychological research.

Any skilled journalist or experienced reader knows that the same news story may take on a different meaning (irrespective of whether it is rephrased or rewritten, differently titled or edited) according to whether it is placed beside a straightforward piece of news, or next to an advertisement, or next to a lurid report of a sex murder.

In manuscripts and early printed books the layout as well as the content (combining text plus comments plus glosses plus scholiae, marginal or interlinear) was often a far more refined or complicated affair than the present thing.

In the case of a legal document, nobody except those who draft it will ever read it as a whole. Lawyers will peruse it (mumbling all the while) looking up the significant passages for any given query or case. They will know where to find what concerns them because *they* (as well as our newspapermen) still have an *ars scribendi*—which implies an *ars legendi.*

As to method, however different their mechanisms and basic techniques, "writing and reading" should not on principle be separated as objects of research when they are seldom separated in daily practice (see Javal, 1905). Finally, there is no reason for limiting research to contemporary documents. At a time when reproductions are so readily available—of pictures, manuscripts, and fine (or not so fine) printing—research workers should not choose deliberately to break with tradition as a matter of principle. They should instead strive to renew and renovate typographical traditions by accelerating the revolution which is already in full swing as a result of the advent of new, and vastly enlarged, methods of communication.

N.B. The reader has probably made out for himself that this reviewer is a typographer, if not perhaps an expert one.

Fernand Baudin

Fernand Baudin (64 rue du Village, Bonlez par Grez-Doiceau, Belgium) since 1954 has been typographic adviser with the Brussels branch of the Amsterdam Type Foundry. Recent publications include *Book Typography 1815–1965* (chapter on Belgium) (London: Benn Ltd., 1966) ; catalogue and exhibition "Stanley Morison and the Typographic Tradition" (Brussels: Royal Library, 1965) ; and *La Lettre d'Imprimerie* (Brussels, 1965).

Carl Dair, *Design with Type*. Toronto: University of Toronto Press, 1967. Designed by Carl Dair. 176 pp. $7.50.

Fourteen years have elapsed since the publication of the first version of *Design with Type*. I use the word *version* and not *edition,* because the work has been thoroughly revised, supplemented, and brought up to date. Today typographic research has developed new dimensions, and the main interest of Carl Dair's study lies in the twofold analysis of past forms and of that uninterrupted creative work: our mechanized script.

It is all the more to be regretted that his first chapter on the origins of writing—which is concerned with the Cretan disk of Phaestos, hieroglyphs, Persian manuscripts, and Chinese script—is more an aesthetic appraisal than a rational analysis of structures, of the relation of material to tool. To have evoked the process of phoneticization of script and the various steps in its standardization would have opened the eyes of the lay audience which the author intends to address, and, to cite an example, would have given Ernst Doblhofer's[1] excellent study its rightful place in the short bibliography.

However, this solicitude for pragmatism finds a place as soon as the author analyzes the nature of type. A few historical and technical references introduce this setting of the stage for the letter, first the letter by itself, and then the "letter, the individual molecule," to use his own terminology. The fundamental principles of Gestalt find a place, applied equally to the composition of the running text, to its texture, to its contrasts, and to its vectors. The author states the rules of harmonious composition and comments upon them. His explication is accompanied by examples, including different printing methods, papers, and the necessary relation between the elements that comprise a printed work.

The laws of unity of style and contrast are cleverly elucidated and minutely scrutinized. The contrast of the type sizes, their "weight," the typographical structures and forms, the use of color, the choice of a properly arranged composition, the quasi-abstract use of composition, all warrant time for reflection and interpretation.

I have suggested that Carl Dair is a resolute Gestaltist: this view is confirmed by the whole of his chapter on the structure of the page. The Wertheimer Laws are fully restated. As is well known, according to this School, forms are to be considered as autonomous units, giving evidence of an internal cohesion that has its own peculiar laws. As Lalande recalled in his formula: "Neither psychologically nor physiologically can any single element be said to pre-exist the whole; it is no more immediate and no

[1] *Zeichen und Wunder*. Vienna: Paul Neff, 1957.

earlier; no knowledge of the whole or of its laws can properly be deduced from the knowledge of the separate parts that may be encountered."

This rehearsal of the first principles of the Gestalt theory brings to mind one of the most remarkable studies of this particular approach to form: Rudolf Arnheim's *Art and Visual Perception, a Psychology of the Creative Eye.*[2] When giving a partial account of this book in my article, "Psychologie de l'art graphique,"[3] I deliberately insisted upon the value of Gestalt analysis when applied to any graphic art such as typography. Carl Dair's study is a glowing tribute to the German psychologists: it was time that typographers should discern in Gestalt analysis the rational solution to their problems.

The aesthetics of the book form are given due historical and technical perspective (without any reference to standard diagrams).

A last chapter is devoted to a few typographic schools: William Morris, the Futurist movement, the bold wisdom of Jan Tschichold which has found an enforced extension in the school of Bâle, and what the author calls "beatnik typography" (quite sober, after all). The influence of photography, photo-montage, photocomposition, and the countless stylistic exercises they invite or allow throw light upon the audacities, the expressionistic or dynamic typography of cartoons (McLaren) and film credits (Saul Bass).

In an epilogue a few examples of experimental typography open the doors of the imaginary world: John Cage, Henri Chopin, Oldrich Hlavsa, and Massin—this last one quite convincing—give proof that typography is an endlessly variegated country, open to new discovery.

By way of conclusion, I emphasize the clarity of the explanation, the richness of the illustration, the selectivity, the refined taste exerted in the matter of choice. Only the paucity of the bibliography is to be deplored, without the least reference to periodicals.

A last wish: that the publishers consider a pocket edition. The work deserves this large public. A private success would be a double misinterpretation.

Philippe Schuwer

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[2] Berkeley and Los Angeles: University of California Press, 1954.

[3] Philippe Schuwer, "Les structures formelles de la page," *Revue Suisse de l'imprimerie,* février, 1959.

Résumé des Articles

Traduction: FERNAND BAUDIN

La Recherche en typographie et dans la Communication—RANDALL HARRISON and CLYDE D. J. MORRIS

Recherche, en typographie, peut être pris en trois sens différents quoique voisins: (1) comme expérimentation d'une hypothèse scientifique, (2) comme expérience artistique et, (3) comme examen critique, historique ou analytique. Les auteurs, se plaçant essentiellement dans le contexte scientifique, s'efforcent d'inscrire la recherche typographique dans le cadre d'une élaboration théorique au sens le plus large. Ils refondent quelques aspects familiers de la mise en page dans les termes généraux de la théorie des communications. L'objet principal de l'article est de faire quelques suggestions qui soient utiles à l'élaboration d'une théorie de la communication typographique y compris les critères et les impératifs propres à déterminer une hiérarchie des buts à atteindre par la recherche.

Facilité relative de lecture des copies dactylographiques: Avec Espacement standard ou espacement proportionnel—DONALD E. PAYNE

Dans quelle mesure les différences d'espacement et de justification affectent-elles le confort de lecture des copies dactylographiques? La vitesse de lecture et niveau de compréhension du texte ont fait l'objet de deux études; une première expérience originale fut faite d'abord; une autre, fut la répétition de la première. On se servit de plusieurs passages empruntés à Davis (Davis Reading Test) tapés sous deux formes: l'une avec espacement proportionnel (IBM Modern); l'autre, avec espacement standard (IBM Prestige Elite). Les résultats furent favorables à l'espacement proportionnel et révélèrent une différence significative dans la vitesse de lecture sans diminution aucune de la compréhension. Ils firent également ressortir une relation entre la difficulté de certains passages et leur espacement. Ce qui donne à supposer que les méthodes couramment employées pour measurer la vitesse de lecture ne font peut-être pas suffisamment apparaître des différences réelles dans la facilité relative des lectures lorsque les comparaisons ne portent que sur des textes faciles ou déjà connus.

OCR-B: Un caractère standard pour l'identification visuelle—ADRIAN FRUTIGER

OCR-B est un caractère standard spécialement dessiné à l'usage des lectrices électroniques. Il comprend des chiffres, des bas-de-casse, des capitales et quelques symboles divers. Les circonstances qui ont mené à l'élaboration de ce caractère sont exposées. Le problème était double: il s'agissait de dessiner un caractère propre (1) à être lu automatiquement par les machines et (2) à satisfaire les exigences esthétiques de l'oeil humain. Le dessin de OCR-B est montré et commenté à la lumière de cette double exigence.

Une enquête concernant un extraînement visuel pour lecteurs débutants—WARREN H. WHEELOCK and NICHOLAS J. SILVAROLI

Apprendre à lire est une activité à la fois associative et conceptuelle. La qualité des associations dépend du discernement auditif et visuel des enfants. L'étude en ques-

tion portait uniquement sur le discernement visuel. Il était question de savoir si les enfants qui, dans une maternelle donnée, avaient été préparés à l'identification instantanée des capitales marquaient un avantage sur ceux qui n'avaient pas reçu ce même entraînement. Dans l'examen statistique des données, on a utilisé la méthode d'analyse de la covariance. Une différence significative fut enregistrée (niveau de confiance .01). Il est donc permis de conclure que l'entraînement en question aiguise le discernement visuel.

La Bibliographie et les recherches en matiere de typographie—G. THOMAS TANSELLE

Les rapports entre les recherches typographiques et la bibliographie sont observables dans quatre catégories principales d'ouvrages: (1) les histoires de la fonderie et de la gravure typographique telles que: *Type-founding in America 1787–1825* (1965) de Rollo Silver, et dans *Civilité Types* (1966) de Carter and Vervliet; (2) les histoires de l'imprimerie et de la librairie, telles que: *The Cambridge University Press 1696–1712* (1966) de D. F. McKenzie; (3) les bibliographies descriptives telles que: le même ouvrage de McKenzie; et (4) les bibliographies analytiques, telles que: les articles de Turner sur le parti bibliographique que l'on peut tirer de l'examen du degré d'usure des caractères typographiques. Ces quelques exemples récents d'application des recherches typographiques en bibliographie illustrent l'interdépendance finale de toutes les études de la lettre.

La conception et la mise en page d'imprimés sur ordinateur CRT—R. J. WAKEFIELD

Dans cet article il est question d'une expérience entreprise en vue d'éprouver les possibilités de l'ordinateur CRT en matière de conception et de mise en page. Il s'agissait de savoir si le CRT permet d'obtenir des compositions d'une qualité typographique passable et dans un corps de caractère suffisamment grand pour donner au pied levé une image suffisamment réaliste d'une mise en page. Quoique le travail fût de nature essentiellement expérimentale il fournit quelques conclusions utiles.

Quelques emplois secondaires des lettres dans le langage écrit—YAKOV MALKIEL

Dans le contexte de cet article on entend par usages secondaires ceux qui impliquent plus que le simple enregistrement de formes connues de la parole et qui interviennent activement dans un langage donné en tant qu'éléments indépendants. On en a distingué cinq usages possibles: (1) une disposition convenue des lettres dans l'ordre alphabétique pour désigner des fragments de texte disposés dans le même ordre; (2) toutes espèces d'abréviations; (altération, alphabétisation, acrostiche); (3) applications diverses suggérées par la forme même des lettres; (4) références—difficilement identifiables—aux sons des lettres; (5) allusion aux désignations données aux lettres que l'on épele à haute voix. On a pris soin de noter les recoupements éventuels de ces différents usages, dont la fréquence s'accroît apparemment très rapidement dans toute société ou discipline qui vise à la "modernité."

Kurzfassung der Beiträge

Translation: TOMAS GONDA and HANS ROERICHT

Forschung in Typografie und das Studium der Kommunikation—RANDALL HARRISON and CLYDE D. J. MORRIS

Der Begriff "Forschung in Typografie" kann in drei verwandten, jedoch ganz unterschiedlichen Bedeutungen verstanden werden: (1) im Sinne der Überprüfung veranschaulichter Hypothesen, (2) im Sinne künstlerischer Suche, (3) im Sinne historischer, kritischer oder analytischer Überprüfungen. Die Autoren, die primär im Bereich wissenschaftlicher Forschung arbeiten, versuchen die visuelle Forschung im weiteren Rahmen der Wissenschaftstheorien zu skizzieren. Sie projezieren einige bekannte Aspekte "of typographic decision-making" in den Rahmen der Kommunikationstheorie. Das Ziel des Artikels ist, herauszustellen was für eine Theorie typografischer Kommunikation brauchbar sein könnte einschliesslich der Forschungsmittel und der Kriterien für eine Hierarchie der Forschungsziele.

Lesbarkeit von Maschinengeschriebenem: Proportionierte Zwischenräume verglichen mit standartisierten Zwischenräumen—DONALD E. PAYNE

In welchem Masse beeinflussen unterschiedliche Zwischenräume und Schriftbreiten die Lesbarkeit von maschinengeschriebenem Material? Lesegeschwindigkeit und Erfassung wurden in zwei Studien verglichen; in einem Test und einer vergleichenden Wiederholung. Das Testmaterial bestand aus verschiedenen Passagen des Davis Reading Tests und wurde in zwei Versionen geschrieben, die eine mit proportionalem Zwischenraum (IBM Modern), die andere mit Standard-Zwischenraum (IBM Prestige Elite). Die Ergebnisse zeigten einen sichtbaren Unterschied der Lesegeschwindigkeit zu Gunsten des mit proportioniertem Zwischenraum geschriebenen, ohne die Erfassung zu beeinträchtigen. Es wurde auch nachgewiesen, dass ein Zusammenhang zwischen Textschwierigkeit und Schriftzwischenräumen besteht, woraus gefolgert wird, dass in Lesbarkeitsmessungen die wahren Unterschiede der Lesbarkeit unterschätzt werden, wenn Vergleiche nur mit einfachen und bekannten Texten angestellt werden.

Eine standartisierte Schrift für optische Erkennung—ADRIAN FRUTIGER

OCR-B ist eine Schrift, speziell entwickelt als internationaler Standard für optische Erkennung durch elektronische Computer. Dieser Schriftschnitt enthält Zahlen, Gross-, und Kleinbuchstaben und einige Symbole. Die Umstände, die zur Entwicklung des OCR-B Schrifttyps führten sind dargelegt. Im Grunde bestand ein doppeltes Problem, eine Schrift zu entwickeln: (a) die automatisch von Maschinen gelesen werden kann, (b) die ästhetisch ist. Der Entwurf des OCR-B wird überprüft im Sinne dieser Kriterien und Beispiele werden gezeigt.

Eine Untersuchung über das Training visueller Unterscheidung bei Lesen Lernenden—WARREN H. WHEELOCK and NICHOLAS J. SILVAROLI

Der Leseakt ist ein assoziativ- konzeptioneller Prozess. Das Gefüge von richtigen Assoziationen zwischen gesprochenem Symbol und geschriebenem

Symbol ist von der Fähigkeit des Kindes abhängig, auditorielle und visuelle Unterschiede zu machen. Diese Studie beschäftigt sich ausschliesslich mit einem Faktor visueller Unterscheidung. Es wurde versucht zu beweisen, dass Kinder im Kindergarten, die geübt waren ummittelbar auf die Wahrnehmung von Grossbuchstaben zu reagieren, bessere Unterscheidungsfähigkeiten zeigten, als diejenigen, die nicht trainiert waren. In der Datenanalyse wurde eine Analyse von Co-Varianten benützt. Die Ergebnisse zeigten, dass zwischen den Kindern, denen gelehrt wurde sofort auf Grossbuchstaben zu reagieren und denjenigen, denen es nicht gelehrt wurde, ein erheblicher Unterschied bestand. Es darf angenommen werden, dass die Erfahrung, solche Unterschiede zu machen, allgemein die Fähigkeit visuell zu unterscheiden erhöht.

Typografische Forschung und Bibliografie—G. THOMAS TANSELLE

Einen Überblick über die Beziehungen von typografischer Forschung und Bibliografie kann man sich durch die Betrachtung von vier Quellen verschaffen: (1) Geschichten vom Schriftgiessen und Schriftentwerfen, wie die des Rollo Silver's *Typefounding in America, 1787–1825* (1965) und Carter und Vervliet's *Civilité Types* (1966); (2) Geschichten des Druckens und des Verlegens, wie diejenigen des D. F. McKenzie's *The Cambridge University Press 1696–1712* (1966); (3) beschreibende Bibliografieen, auch von McKenzie; und (4) Arbeiten bibliografischer Analyse, sowie Robert Turner's Artikel über den bibliografischen Nachweis von Schriftbeschädigungen. Diese kürzlich veröffentlichten Beispiele typografischer Forschung in der Bibliografie veranschaulichen die gegenseitige Abhängigkeit aller Untersuchungen über Druckschriften.

Layout und Entwurf mit einem CRT Computer-System—R. J. WAKEFIELD

Diese Abhandlung ist eine Darstellung einer Untersuchung über die Möglichkeiten der Verwendung eines mit einem CRT-Display für Layout und Entwurfsarbeit ausgestattenten Computers. Diese Untersuchung war hauptsächlich der Ermittlung gewidmet, ob ein CRT-System Abbildungen von ausreichend typografischer Qualität hervorbringen könne, deren Schriftbild-Grosse so beschaffen sein könnte, dass ein realistisches Layout einer Seite zu jeder Zeit gezeigt werden könnte. Diese Arbeit diente im wesentlichen Untersuchungen, ermöglichte es jedoch, Folgerungen zu ziehen.

Der sekundäre Gebrauch von Buchstaben in der Sprache—YAKOV MALKIEL

Mit "sekundärem Gebrauch" wird in diesem Artikel diejenige Verwendung von Buchstaben bezeichnet, die nicht nur der direkten Aufzeichnung von vorhandenen Sprachformen dient, sondern sich als unabhängiger Teil voll an der Sprache beteiligt. Fünf solcher unabhängigen Anwendungen sind aufgeführt: (1) die konventionelle Anordnung von Buchstaben in alphabetischer Reihenfolge und die speziellen Funktionen gewählter Teile dieser Reihenfolge; (2) alle Arten von Abkürzungen (truncation, literation, acronyms); (3) verschiedene Formverknüpfungen von Buchstaben; (4) Hinweise über an sich schwer zu entdeckende "akustische Formen" von Buchstaben; (5) Andeutungen über konventionelle Bezeichnungen bei der Aussprache von Buchstaben. Wert gelegt wurde auf gelegentliche Überschneidungen dieser einzelnen Erscheinungen, deren Frequenz sich sprunghaft zu verlagern scheint in den Gesellschaften und Kulturen, die heute den ersten Platz beanspruchen.

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