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A Method of Quantifying Order in Typographic Design

Gui Bonsiepe

A description is given of a method to compare in quantitative terms the degree of order of two typographically designed pages. A distinction is made between two kinds of order: the order of a system (systemic order) and the order of arrangement. The Shannon formula was used for measuring the degree of order of the two designs—an old version and its redesign. It shows that a judgment based on optical evidence can be supported by a mathematical-empirical judgment. Possible consequences for an aesthetics based on information theory are drawn. A design heuristic is sketched, and the possibilities as well as limits of an algorithmization of design decisions are discussed.

Introduction: Mathematical Aesthetics

Any attempt to express in mathematical terms the physical correlate of percepts comes under grave suspicion of being academic in intention and conservative in result. And this suspicion is aggravated when statements about the pattern of the stimulus (objective description) are confused with those about its aesthetic properties (subjective evaluation).

The mathematicization of aesthetics, or more specifically of visual aesthetics, has resulted in two main doctrines: that of proportion and that of distribution. The first is concerned with the quantitative relationship between elements (e.g., the ratios of distances and gray-scale values). The second is concerned with the distribution of elements within configurations. (In neither type of aesthetics based on mathematics can the explicative and generative aspects of a design be separated. The principle of arrangement underlying the design of a facade should both explain the pleasure it affords and illustrate the method by which it was created.)

The doctrine of proportion has elected geometry as its patron; that of distribution draws upon statistics. Notwithstanding the substantial

differences between these two aesthetic approaches in their mathematical apparatus, the properties they explore are very similar. They are syntactic properties; i.e., properties which consist entirely of intersign relationships. The semantic dimension has so far remained inaccessible to mathematical aesthetics, and in the light of this it might be pertinent to ask how historicity can ever be put into numbers. It might be said in response that what is typical in a work can be expressed in typical numerical values. Undoubtedly. But the idea that a number—apart from its function as a numerical tag—has any expository force or can convey information about a work is still open to doubt.

Seeking a mathematical explanation of the beautiful is rooted in the desire to rationalize preferences. This is a wish which cannot be entertained by anyone who realizes that beauty is more complex than mathematics and that it is not advisable to mix two different universes of discourse which are not reducible to each other. Not to accept this advice is to risk the criticism that one is celebrating accuracy in trivia and cultivating bad platonism by elevating a stock, as it were, of transhistoric forms to a glorified museum status. But although beauty is not immanent in mathematics, this does not mean that it cannot be codified by mathematical processes. The heuristic value of mathematics for creative design clearly exceeds its epistemological value. Mathematics must be conceived as providing design with a series of instruments for the conscious and controlled generation of forms, rather than as a source of explanations for aesthetic phenomena. Mathematics is more successful in making things than in explaining the beauty of what is made. It is no longer possible to offer methodological excuses for the meagreness of the objects upon which mathematical aestheticians exercise their skills by arguing that one has to start with the simple before proceeding to the complicated. There is no lack of simplicity about geometrical patterns, upon which designs are based. Traverse surveys and vase contours are among the objects for which it is difficult to claim a key position in aesthetic experience.

In its application to aesthetic problems, information theory has been rightly charged with using a great deal of paraphernalia and having little to show for it. Nonetheless, it must be admitted that a statistical theory of the physical substrates of information has had a fruitful influence on the development of aesthetics, if only in the sense that modern terminology has enabled us to bring familiar phenomena into

sharper focus. Yet it remains in servitude to classical aesthetics so long as it sees the most pressing problem of aesthetics as the formulation of a theory of beauty. A system of axioms would first have to be replaced by an empirically based theory of preferences. Only then would aesthetics be liberated from its conservative shackles.

All this underlines the wisdom of exercising great caution in drawing parallels between expressions of preference and the mathematical categorization of the stimulus pattern. Another qualification is necessary. Earlier works by the author (1965, 1967) in which Shannon's complexity formula was applied to design problems must, in the present state of knowledge, be relativized. There are two reasons for this:

1) It has not yet been determined at what number of elements the statistical formula becomes operable—at 10, 50, 100, 500, or 1000 elements.

2) No one has yet thought out the theoretical consequences arising from the fact that qualitatively different formal elements—e.g., straight line and circle—are compared with respect to the effort required for their description and generation.

The Creation of Order

There is a platitude which might be very well applied to the activities of the designer—namely, that a state of order is preferable to a state of disorder. For, among many other things, designing means creating order, means putting structure into an array of objects or signs, means reducing disorder and arranging elements into a whole that makes sense. To be sure, the creation of order is the daily business of the designer; but so far there has been (a) no design heuristic as a set of operational rules which say how order is to be created, and (b) no procedures by which the varying degree of order displayed by different design solutions can be quantified with accuracy.

In comparing the order of two designs, one usually judges on visual merits. And in practice that is perfectly adequate. Yet a mathematical correlate for such psychophysical judgments would certainly be welcome, however inaccessible this aspect of design may appear to the popular mind. Two psychologists may be quoted as writing, with slight modifications, that it is evidently more difficult to measure order than to manipulate it (Attneave and Arnoult, 1966).

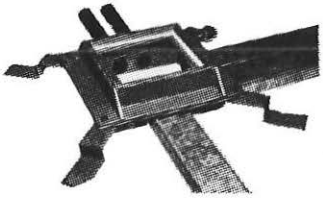
There follows a report of an attempt to measure the difference in

Bauteile für Unterflur-Installation (System B)

Lichte Weite	Höhe	Bodendose ohne Bodenplatte Bestell-Nr.[1]	1 Stück Preis[2] DM	1 Stück netto kg	Bodendose mit Bodenplatte Bestell-Nr.[1]	1 Stück Preis[2] DM	1 Stück netto kg
mm	mm						
Für Blechkanäle[1]							
129×129	25 35	5VP3 019 5VP3 029	28.70 29.—	0,8 1	5VP3 119 5VP3 129	30.80 31.20	1,1 1,3
180×180	25 35	5VP3 039 5VP3 049	35.— 35.50	1,4 1,6	5VP3 139 5VP3 149	37.— 37.50	2,1 2,3

Gegenrahmen

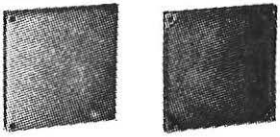
Zur Aufstockung der Bodendosen bei Estrichhöhen über 50 mm. Sie werden mit der Flanschseite nach oben unter die Bodendose gesetzt. In den Gegenrahmen sind die Einführungsöffnungen für die Kanäle vorgestanzt.



Für Bodendosen mit lichter Weite mm	Höhe mm	Gegenrahmen[1] ohne Bodenplatte Bestell-Nr.	1 Stück Preis[2] DM	netto kg	mit Bodenplatte Bestell-Nr.	1 Stück Preis[2] DM	netto kg
129×129	25 35	5VP3 219 5VP3 229	13.— 13.20	0,7 0,86	5VP3 319 5VP3 329	15.— 15.20	1 1,2
180×180	25 35	5VP3 239 5VP3 249	16.40 16.70	0,96 1,1	5VP3 339 5VP3 349	18.60 19.20	1,7 1,9

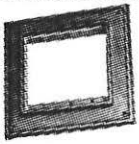
Verschlußdeckel für Bodendosen

Die Verschlußdeckel können sowohl mit der glatten als auch mit der Hohlseite nach oben aufgeschraubt werden. Die nach oben liegende Hohlseite läßt sich mit dem gleichen Bodenbelag ausfüllen, den der Raum hat.



Für Bodendosen mit lichter Weite mm	Bestell-Nr.	1 Stück Preis DM	1 Stück netto kg
129×129	5VP3 41	9.50	0,18
180×180	5VP3 43	14.80	0,35

Übergangsstück für Bodendosen

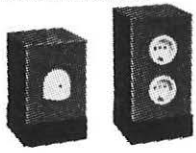


Das Übergangsstück ist erforderlich, wenn eine Zapfsäule auf eine Bodendose mit der lichten Weite 180×180 mm montiert werden soll.

Das Übergangsstück kann sowohl mit der glatten als auch mit der Hohlseite nach oben aufgeschraubt werden. Die nach oben liegende Hohlseite läßt sich mit dem gleichen Bodenbelag ausfüllen, den der Raum hat.

Bestell-Nr. 5VP3 42, 1 Stück Preis DM 20.50, netto 0,68 kg.

Zapfsäulen aus Stahlblech



Die Zapfsäulen nehmen die Installationsgeräte (z. B. SCHUKO-Steckdosen) und die Schwachstrom-Klemmenleisten auf. Eine Zwischenwand innerhalb der Säule trennt die Starkstromseite von der Schwachstromseite. Als SCHUKO-Steckdosen sind Geräte mit Zentralplatte vorgesehen. An Stelle der SCHUKO-Steckdosen können auch andere Installationsgeräte, z. B. Kraft-Steckvorrichtungen eingebaut werden. Näheres auf Anfrage. Um das Anschließen der Schwachstromleitungen zu erleichtern, kann für die 2- und 3-etagigen Zapfsäulen ein Kippbügel geliefert werden, mit dem sich die Klemmenleisten nach oben oder unten ausschwenken lassen.

1) Die Einführungsöffnungen für die Kanäle bzw. für Stahlrohre werden werksseitig hergestellt. Der Bestellung ist eine Skizze beizufügen.
2) Zuzüglich Preis für werksseitig hergestellte Einführungsöffnungen. Preis je Öffnung DM 0.80.

Figure 1. Old version of a catalogue page.

Bauteile für Unterflur-Installation (System B)

3.
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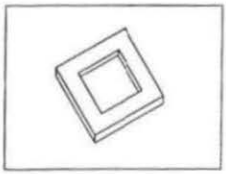
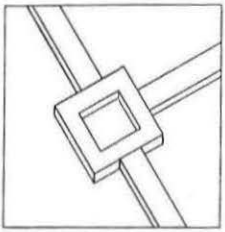


Lichte Weite mm	Höhe mm	Bodendose ohne Bodenplatte Bestell-Nr.[1]	1 Stück Preis[2] DM	netto kg	mit Bodenplatte Bestell-Nr.[1]	1 Stück Preis[2] DM	netto kg
Für Blechkanäle[1]							
129×129	25	SVP3 019	28.70	0,8	SVP3 119	30.80	1,1
	35	SVP3 029	29.—	1	SVP3 129	31.20	1,3
180×180	25	SVP3 039	35.50	1,4	SVP3 139	37.—	2,1
	35	SVP3 049	35.—	1,6	SVP3 149	37.50	2,3



Gegenrahmen
Zur Aufstockung der Bodendosen bei Estrichhöhen über 50 mm. Werden mit Flanschseite nach oben unter die Bodendose gesetzt. Im Gegenrahmen vorgestanzte Einführungsöffnungen f. Kanäle

Für Bodendosen mit lichter Weite mm	Höhe mm	Gegenrahmen[1] ohne Bodenplatte Bestell-Nr.	1 Stück Preis[2] DM	netto kg	mit Bodenplatte Bestell-Nr.	1 Stück Preis[2] DM	netto kg
129×129	25	SVP3 219	13.—	0,7	SVP3 319	15.—	1
	35	SVP3 229	13.20	0,86	SVP3 329	15.20	1,2
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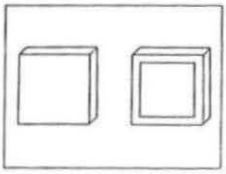

Verschlußdeckel für Bodendosen
können mit der glatten oder mit der Hohlseite nach oben aufgeschraubt werden. Die nach oben liegende Hohlseite läßt sich mit dem gleichen Bodenbelag ausfüllen, den der Raum hat.

Für Bodendosen mit lichter Weite mm	Bestell-Nr.	1 Stück Preis DM	netto kg
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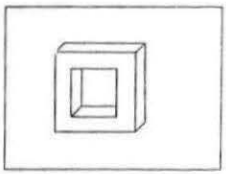
180×180	SVP3 43	14.80	0,25



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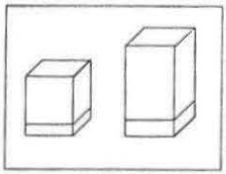
Bestell-Nr. **SVP3 42**, 1 Stück Preis **DM 20.50**, netto 0,68 kg.



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2) Zusätzlich Preis für werkseitig hergestellte Einführungsöffnungen. Preis je Öffnung DM —.80.

Figure 2. Redesign of the catalogue page according to the rules of the design manual. (Half-tone prints are represented schematically.)

order between two typographic designs of a printed page. Figure 1 shows the original design; Figure 2, the redesign according to the style manual which will be discussed more fully below.

Two Types of Order

Order is a relational concept. It does not vary with magnitude. To be able to speak of the order of a configuration or an ensemble, we need several elements which have a defined relationship one to the other. In typography order is mainly a question of dimensional relationships within groups of elements (e.g., the proportion of picture sizes and line lengths) and the distribution of these elements on a page and in a printed work. In this connection a distinction must be made between two types of order:

1) The order of the system. From this standpoint the typographic items (main headings, blocks of composition, number of pages, illustrations, tables, and footnotes) are regarded as elements of a system. This order is a function of the data needed to describe all the items occurring—i.e., the dimensional classes and the frequency with which the dimensions occur. A hypothesis may be formulated that the smaller the number of dimensional classes and the greater the number of the elements contained in these classes, the higher will be the degree of order of the whole; for order depends to a large extent on the repetition of elements.

2) The order of arrangement. This type of order is based on the relational connections between the items within a configuration (or, in terms of information theory, within a supersign). This order is a function of the horizontal and vertical reference lines on a page and the frequency with which the corners of the items fall on these lines.

Both types of order, although distinguishable analytically, overlap and influence each other. Their interaction determines the relative simplicity of a typographical page and the ease or difficulty with which it can be taken in at a glance.

Determination of the Degree of Order

In order to allow a comparison between the old and new versions of the catalogue page and to reveal the structure or skeleton of the designs, a number of conditions had to be observed and an operation performed on the items:

1) The type of items used was to remain constant—e.g., a table of the old version corresponds to a table of the new version.

2) The information content of both versions was to remain constant—e.g., the information contained in a footnote in the old version was to be taken over into the new version. Without impairing intelligibility, the quantity of composition in one block was slightly compressed in order to accommodate the text in the space available. The redundancy cushion allowed this compression.

3) The parallel arrangement of the items with respect to the edges of the page was to be maintained—i.e., items were neither turned over nor tilted.

4) The items were to be inscribed in rectangles corresponding to their real or maximum possible extents, which were not to overlap another item (Figs. 3 and 4). All items are similar in having four right angles. The similarity increases to the extent that other elements—vertical and/or horizontal sides—are equal.

First the dimensions of width and height of the items of both versions were compared. To this end it was assumed that the dimensional order—i.e., in this case the system order of the typographical items appearing on a printed page—is a function of the information needed to generate these items from the dimensions of the sides. The question was therefore raised: how often does the side dimension i, j . . . n occur? In this way the number of width classes and height classes and their relative frequency can be determined. The following particulars were established.

Old version: 19 widths divisible into 9 classes; 19 heights divisible into 14 classes (Fig. 5a).

New version: 20 widths divisible into 3 classes; 20 heights divisible into 5 classes (Fig. 5b). (The higher number of items in the new version is due to the fact that a text set as a single column in the original version was set as a double column in the redesigned version.) To determine the complexity of the system expressed here as an order, we used the Shannon formula:

$$C = -N \sum_{i=1}^{i=n} p_i \, \mathrm{ld} p_i$$

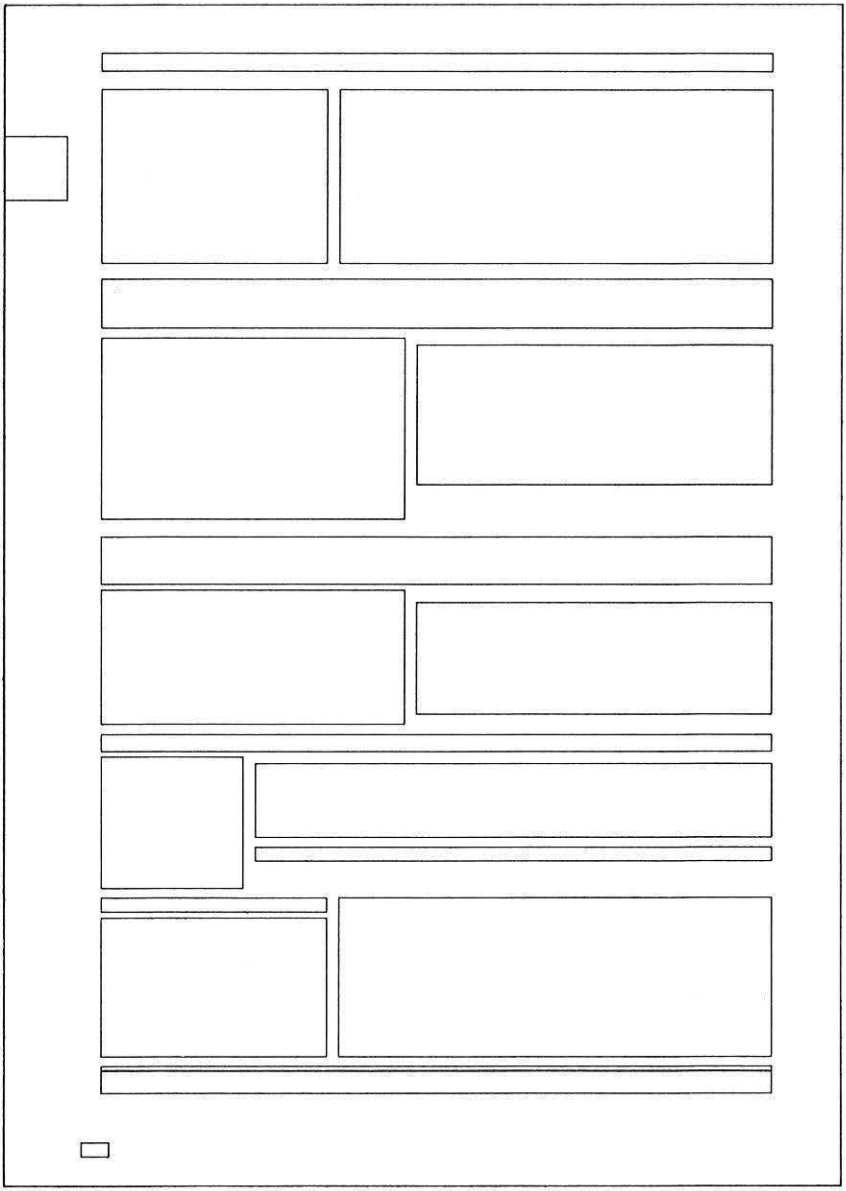

Figure 3. Contour lines around items of the old version.

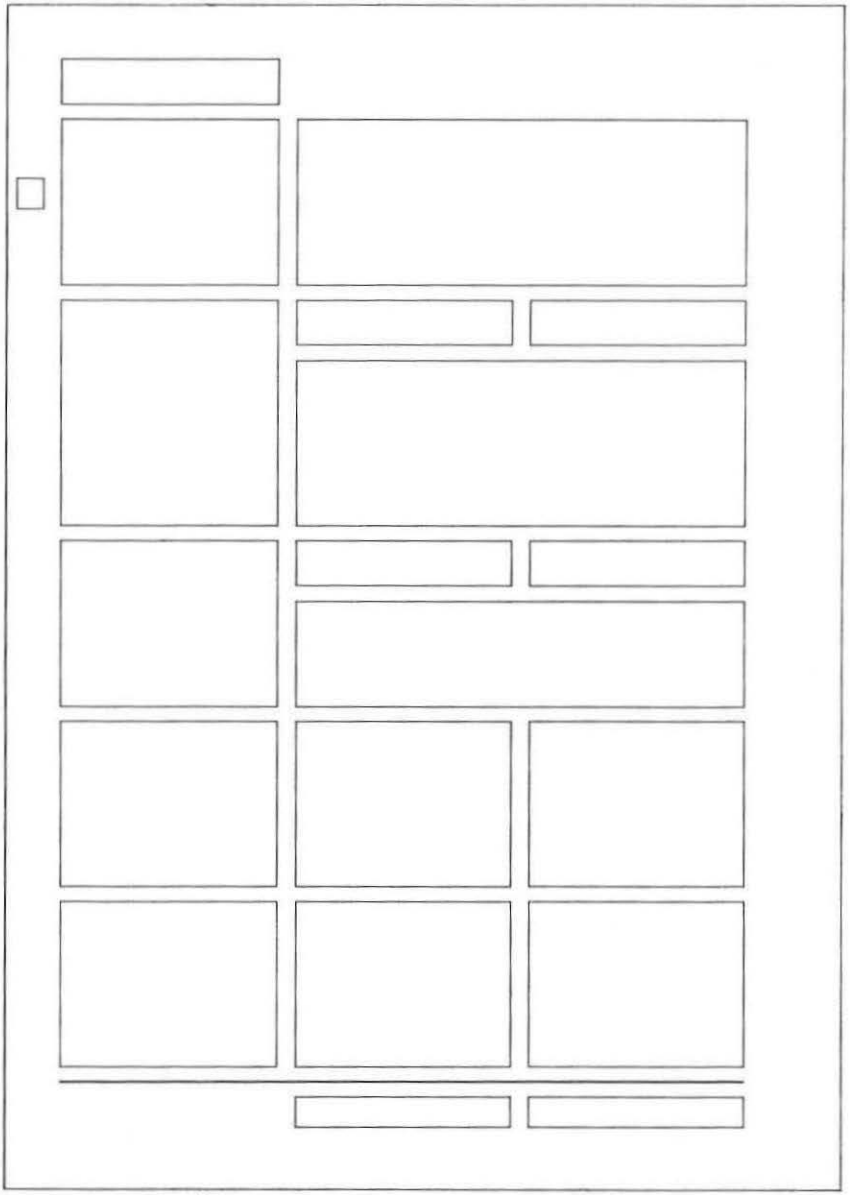

Figure 4. Contour lines around items of the redesigned version.

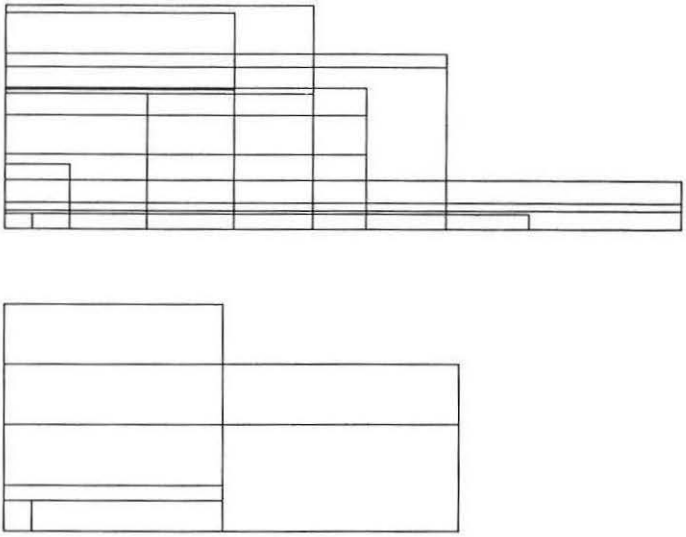

Figure 5. The "systems order" of the elements. Comparison between the old solution (5a) and the redesign (5b).

The data inserted in this formula led to the following results:
Old Version: widths 53 bits, heights 70 bits.
New Version: widths 18 bits, heights 37 bits.
The resulting ratio of total bits for the old versus the new version is 123 to 55, or in percentage, 100 to 45. It is clear that the new version is some 55% simpler than the old, which in this context means better ordered. As already explained, this value refers to the degree of order of the ensembles compared together, to the character of the typographic components as elements of a system, but not to the arrangement of the items on the printed page.

For the second type of order the hypothesis similarly holds good that the order of distribution is a function of the information needed to create this arrangement of the items on the printed page. The position of an item is determined by two coordinates. The coordinate frame originates in the left upper corner of the printed page. The location of, say, an illustration is determined by specifying the distance of its left upper corner from the top edge and from the left edge. If items are "suspended" on a horizontal reference line—"clothesline typography" as it is called—the corresponding y-dimension occurs several times; i.e., its frequency

increases. The same holds true of the vertical reference lines and the corners of the items located on them.

The following data were determined for the distribution order:
Old version: 19 vertical distances from the top edge divisible into 17 classes; 19 horizontal distances from the left edge, divisible into 6 classes (Fig. 6).
New version: 20 vertical distances from the top edge, divisible into 10 classes; 20 horizontal distances from the left edge, divisible into 4 classes (Fig. 7). Introducing these into the complexity formula we obtain the following results:
Old version: 90 bits + 37 bits = 127 bits
New version: 63 bits + 35 bits = 98 bits.
This is a ratio of 127:98. Converted into a percentage (100:77), this shows that the distribution order of the new as compared with the old version has increased by 23%. This state of affairs is illustrated by the smaller dispersion of the corners of the new version as can be seen from the diagrams (Figs. 6 and 7). In terms of gestalt psychology this lower value corresponds to the law of "common destiny": the corners of the items of the new version form imaginary rectangular patterns which are clearly visible to the eye.

On the assumption that the overall order of the printed page results from the degree of order of the items and the distribution of the items, the two values may be added. It may be deduced from the ratio 250:153 (or 100:61 in percentage) that the degree of order in the new version is some 39% higher than in the old. Judgment based on optical evidence confirms that one of the versions is more ordered than the other. The mathematical-empirical judgment determines by how much one version is more ordered than the other.

A Design Heuristic

Design solutions may be of two kinds: they may produce a result which is fixed once and for all, or they may involve the planning of design guidelines within whose framework a series of results may be subsequently produced. In the second case the design planner marks out the area of decision for the executing designer. This type of design activity might be described as pre-design, its purpose being to routinize or semi-routinize the maximum possible number of design decisions. The degree of semi-routine—i.e., the degree to which the area of decision is

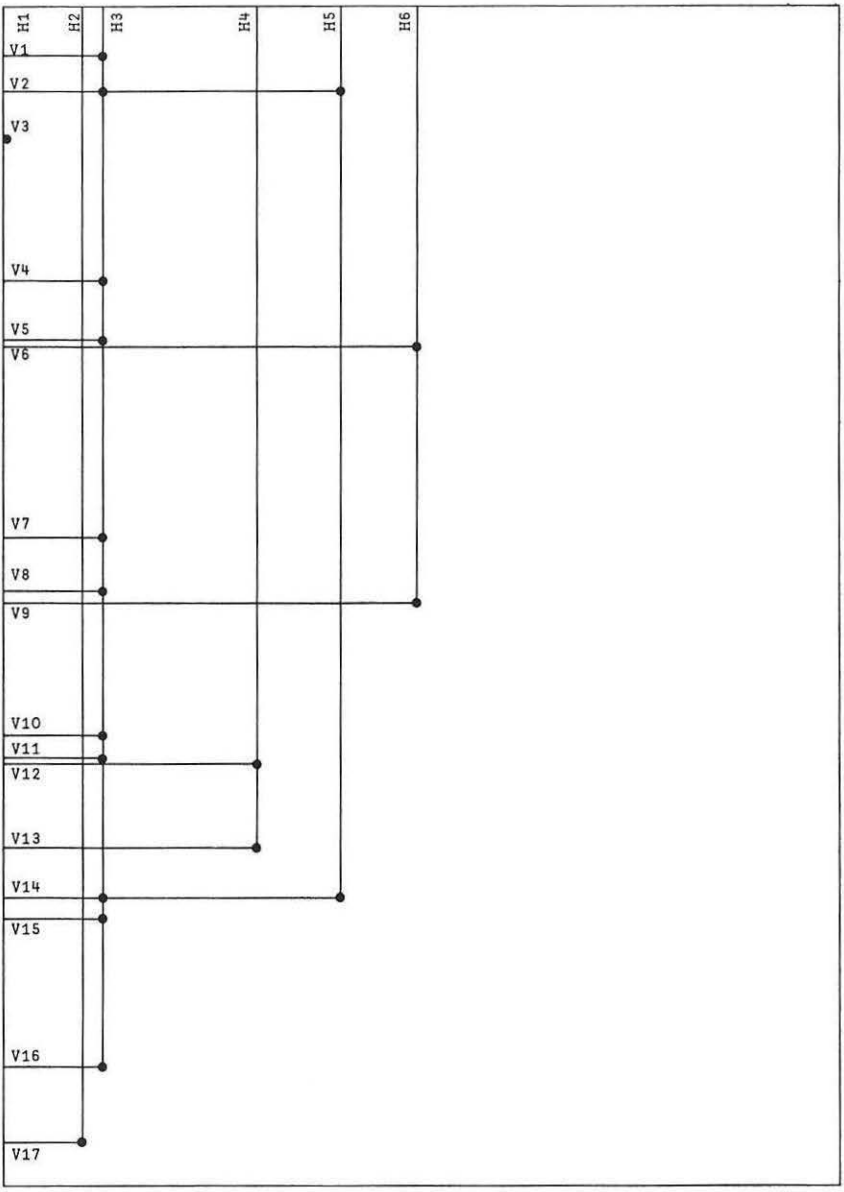

Figure 6. Distribution of location points along horizontal and vertical measures of the old version.

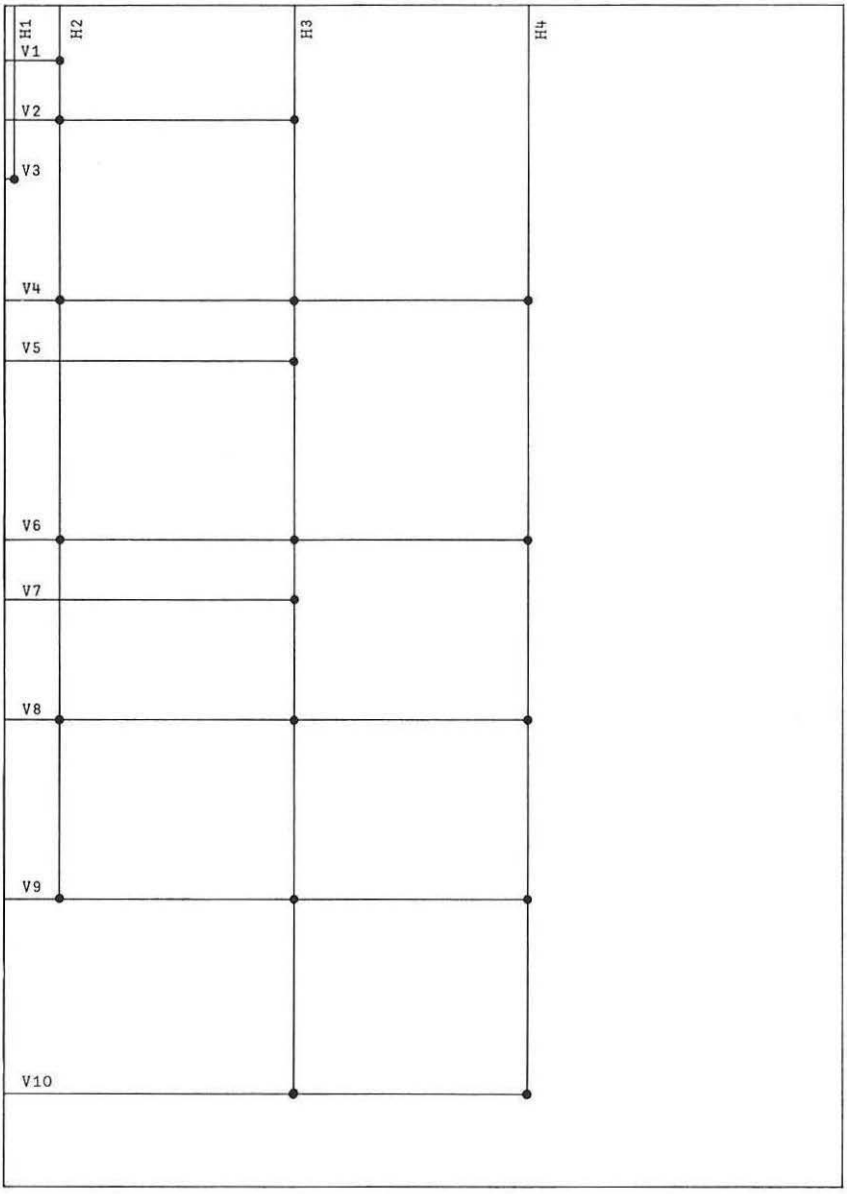

Figure 7. Distribution of location points along horizontal and vertical measures of the new version.

	Form of typeface	Size of typeface	Character of typeface (e.g., bold)	Kind of typeface (e.g., compress)	Inclination of typeface (e.g., italics)	Upper-case (capitals)	Extended composition	Tone background	Inversion	Colored printing	Orientation (e.g., vertical line)	Empty space, one line	Empty space, n lines	Leading up to one line	Stroke	Separation by drawn line	Underlining	Fixed position	New line	Indentation	Surrounded by lines
Titles																					
Level 1			x									x						x			
Level 2			x									x									
Level 3												x									
Level 4															x				x		
Text																					
Standard																					
Special										x											
Innumeration																			x		
Formula																			x		
Paragraph												x									
Period																			x		
Footnote		x														x		x			
Reference		x																			
Caption																		x			
Name																					
Merchandise																					
Producer																					
Logotype			x																		
Index																					
Product group ..			x															x			
Page number			x															x			
Table																					x
Line drawing																					x
Halftone illustration																					

Figure. 9. Matrix of typographical variables (means) and typographical items (functions). The lines standard text, name of merchandise, and producer's name are empty because the selected size of the typeface served as point of reference.

proviso that although the graphic-typographic system makes it easier to achieve a multiplicity of variations in the individual pages of the work, it cannot replace the executing designer. Moreover, it must be conceded that any problems cropping up cannot be foreseen in all their extent and for this reason cannot be planned for.

The design manual—which is a modest work of its kind—contains just 100 verbalized instructions formulated on two basic axioms: the axiom of economy of means and the axiom of formal coherence.

Work on the manual proceeded in three phases. In phase 1 it was decided which elements went into the system. Method employed: listing. In phase 2 the elements were compiled into element groups. Method employed: testing the dependence of the elements, the functional relationship of the elements. In phase 3 the rules were formulated in the light of the two axioms stated above. One of the familiar rules of thumb (heuristics) used in this connection is illustrated in the following example. The problem is to know which width of type area will go into whole or half cicero measures (cicero = 12 points didot, 13 English-American points) when the type is set in two or three columns with 1 cicero between the columns. Constraints are: paper width 21 cm., minimum fore-edge, maximum back, maximum width of type measure. Ideal solution: 41 cic. (20/1/20 cic.; 13/1/13/1/13 cic.). Solution selected: 38 cic. (18.5/1/18.5; 12/1/12/1/12).

Aesthetics and Order

So far nothing has been said about aesthetic preferences, although aesthetic considerations have naturally had a part to play in the formation of the maxim system. The conclusion that the new version, in comparison with the old, is more beautiful is not one that is susceptible to logical validation. But, as far as the designer is concerned, it may be assumed that the concept of order and the concept of beauty often coincide. To claim that the concepts are synonymous or to subsume the concept of beauty under that of order is possible within the terms of an aesthetic which succeeds in explaining the descriptively analyzed data. Assuming that the reponses of a number of text subjects are favorable—i.e., assuming that the new version is felt to be better ordered—an aesthetic theory might adduce the mathematically categorized objective correlate of the subjective judgments as a verification of the hypothesis "designed beauty is a function of designed order."

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"Writing" and "Alphabet"

John Mountford

The two English words "writing" and "alphabet" are both linked to language. The notion of language is built into "writing," and the notion of writing is built into "alphabet." Different disciplines which use these words as technical terms, use them differently; and everyday usage is often imprecise. Linguistics, as the science of language, can contribute towards sorting these meanings out. A start is made in this direction, in the belief that related disciplines ought not to be "divided by a common terminology."

PART I: The Word "Writing"

1.0 Considering its significance in human history, it is surprising that the transmission of language in the form of writing continues to receive comparatively little *concerted* attention. Perhaps the disunity of the many disciplines concerned with writing under its admittedly diverse aspects, both practical and academic, has contributed to the rise of what might be called "speculative mediastics" in recent years.[1]

Is typography one of the disciplines concerned with writing? In one sense of the word "writing," yes; in another, no. The first sense is the important one: typography is crucially concerned with the transmission, in the modern world, of language in the form of writing—of "the written word," as it is often called. By comparison, the second sense is trivial: typography is not concerned with *hand*writing; there are other disciplines, such as palaeography, to whose province handwriting belongs. Though this point is trivial, the confusion sometimes caused by the different

1. See Marshall McLuhan, *Understanding Media* (New York: McGraw-Hill, 1964) or, better, *The Gutenberg Galaxy* (Toronto: University of Toronto Press, 1962.)

uses of the word "writing" is not trivial. Sometimes, for instance, the handwriting sense obtrudes and makes us hesitate to affirm that typography is concerned with writing. Yet it is.

Both disciplines, typography and palaeography, are equally concerned with the transmission of *language in the form of writing*. From this point of view the way in which writing happens to be produced or reproduced physically is immaterial. Mechanical or manual, writing is all one and stands in a single relationship to language. It is from this point of view, a linguistic one, that we shall try to disentangle some of the senses in which the word "writing" is used in English.

1.1 Four quite usual senses of the word "writing" are exhibited in the following expressions:
(1) in speech or writing
(2) reading and writing
(3) in writing or in print
(4) in ordinary writing, not in shorthand.

In (1) writing is contrasted with speech as a *medium of language*. This arrangement of the three terms "language," "speech," and "writing," is the commonest in linguistic science. Language is the human attribute, the system of communication characteristic of human beings. Speech transmits language aurally; writing transmits language visually. "Language" is a higher-order term denoting something more abstract than either speech or writing.[2]

Language is the organisation (grammatical and semantic) which the two media have in common (they have very little else in common, when one thinks about it). The obvious differences in their physical substances (typified by "air" in the case of

2. Note that colloquially and in some specializations (notably certain branches of psychology, physiology, and anthropology unconcerned with writing) "speech" is the traditional term for the human attribute. Note also that not all linguists have accepted the "triangular" arrangement of the three terms: Leonard Bloomfield, in his classic book *Language* (New York: 1933; London: Allen & Unwin, 1935), equated the study of language with the study of speech, to the exclusion, theoretically, of writing.

speech, by "ink" in the case of writing[3]) are not the only differences between the two. They differ also, for example, in the manner of their acquisition: we are equipped at birth to acquire language spontaneously in the medium of speech, but not in the medium of writing. The two differ in several other ways, but they are matched together in expressions like "speech and writing" for a very plain reason: because they are, for us, the two *normal media* of language. Lip-reading and gesture and touch can provide other language media, but these are abnormal media; whereas speech and writing are both regarded as normal media in modern societies.

Let us call this sense "writing—1." The expression "in speech or writing," then, enshrines a reference to media of language, and writing—1 designates one such language-medium. This is the widest, and the most basic, of the four senses exhibited above.

1.2 In (2) writing is paired with reading. Having determined the medium by contrast to speech, we now have two terms which refer to the complementary skills of this medium: taking in language in this medium is the skill of reading, giving out language in this medium is the skill of writing, writing—2. The corresponding skills in the medium of speech are "hearing" and "speaking." These four (hearing and speaking, reading and writing) are the basic skills of normal linguistic communication. Each of these four terms designates a complex skill which embraces both the linguistic organisation and the concomitant physical activity involved in receiving or producing language in either of the two media. When paired with "speaking," "hearing" has a specifically linguistic sense which it lacks on its own. In isolation it reverts to its general, wider sense of receiving any sounds; coupled to "speaking," it is used of taking in language by ear, a skill which is acquired in advance of speaking in infancy. "Reading" and "writing" (like "speaking") retain their linguistic content in isolation—though, when parted from each other and used

3. See H. J. Uldall, "Speech and Writing," *Acta Linguistica*, IV (1944), 11–16.

respectively of reading out sounds and of penmanship, they may lose it in the opposite direction, that is, through being narrowed down. This narrowing down to constituent or apprenticeship activities is sometimes allowed to obscure the most general and important sense of these two terms in which they contrast with each other as designating the basic linguistic skills of the written medium.

Writing–1, then, is a language-medium; writing–2 a language-skill.

1.3 In (3) "writing" means "handwriting," a trivial sense by comparison with writing–1, but by no means a trivial aspect of man's linguistic activity. Handwriting and print are two manifestations of writing–1; typewriting is a third. There are others, but these are the three that matter most in the modern world for the transmission, in books, agreements, letters, timetables, etc., of language in long stretches. Once again, we are wholly within the language-medium of writing (writing–1); the language-skill involved in production is writing–2 (in reception it is reading); and the differences relate to three different *media of writing,* viz., handwriting, typewriting, and print. Writing–3, then, can be regarded as short for "handwriting," both in ordinary usage and in those disciplines in which only handwriting is in question, such as palaeography or calligraphy.

To sort out these different senses of "writing," along these or similar lines, is an elementary first step towards clear thinking and clear interdisciplinary discussion, especially when the meaning is flickering between senses (1) and (3). Typography is a discipline inescapably concerned with writing–1, incidentally or not at all with writing–3. When necessary, ambiguity can be avoided by firmly using "handwriting" and resisting the word "writing" when writing–3 is meant.

1.4 By similar care the vagueness of writing–4 ("in ordinary writing, not in shorthand") can be avoided. This is not such a widespread use as the other three, since people have less occasion to talk about shorthand and "ordinary" writing than about speech and writing, reading and writing, or print and writing. All

the same, it is found in everyday usage, and it is frequent in certain kinds of discussion of spelling reform or of initial literacy teaching (the teaching of reading, as it is usually called). These topics share with the discussion or exposition of shorthand the need to compare and contrast one or more "ways of writing" English (or whatever the language happens to be). To use the term most generally accepted in linguistics, the contrast in question is between a number of *writing-systems* for a given language. The writing-systems under discussion may be the standard orthography and a number of shorthands, or the standard orthography and a number of proposed ("reformed") orthographies, and so on. Writing-systems specially designed for initial literacy teaching are another category; Pitman's i.t.a. (Initial Teaching Alphabet) and Malone's Unifon are recent examples of such pedagogical writing-systems. Other categories of writing-system exist besides these three, such as linguists' systems of transcription and transliteration. There is no limit to the number of writing-systems that a language may have.[4]

"Writing," then, is used in the sense of a "way of writing a language" in expressions like "our ordinary writing" or "our conventional writing" (cf. "in French writing," "in Chinese writing"). This is a colloquial use—though it will be found in non-colloquial contexts as well[5]—in comparison with the use of "writing-system" to designate the genus of which orthographies and shorthands are two species. The vagueness inherent in using "writing" in the sense of writing—4 can be eliminated by using the technical term "writing-system," which denotes a precise and important linguistic concept.

4. On this view, a description of a language (that is, a grammar) may be said to *select* the standard orthography for description, if it deals with the orthography at all.

5. "Our ordinary alphabet/spelling/script" or even "our ordinary print" are other colloquial expressions which are found used with the same meaning—and these also are not always confined to colloquial contexts.

1.5 To sum up:
writing–1: language-medium
writing–2: language-skill
writing–3: writing-medium
writing–4: writing-system.

There are, of course, other senses of the word "writing" (as there are, for example, of "reading") which have not been mentioned; and there is much to elaborate about those senses that have been mentioned, and about the terminology adopted in this brief discussion. Even the above summary is misleading unless the colons are carefully interpreted!

1.6 In semantics—the branch of linguistics which studies meaning—multiple meanings of words cause no surprise; indeed, a large part of semantics is devoted to the study of this phenomenon. It is found in all languages, and the name given to it is "polysemy." The range of meanings of the word "writing" is just one example of the polysemy exhibited by most words in English which relate to important concepts, especially when these words are the common property both of everyday discourse and of a variety of specialised discourses.

What must be remembered with regard to writing is that the notion of language is built into it. This must not be lost sight of anywhere along the line, the line which goes from the literate mind, through the production of writing, the reproduction of writing, and the reception of writing, to the literate mind again. It must not be lost sight of whether writing is being considered *per se,* or in comparison with other means of communication, linguistic or non-linguistic.

2.1 Literacy—the ability to use language in the form of writing—is a universal human potential. Upon this assumption all modern educational systems are built. This potential is being realised in the world today in several hundred different languages.

Languages differ from each other in many ways. The science of linguistics is concerned equally with the unity of human linguistic ability—the mainspring of contemporary "psycholinguistics"—and with the variety of its manifestations. One aspect of this variety is external, or social; one aspect is internal, or structural. There is no absolute dividing-line between these two aspects of language.

Among the points of social (or external) difference we will put the following: the size of the community served by the language, varying from a handful of people to communities of hundreds of millions; the status of the language, whether international, national, local, or liturgical, etc.; the standardisation of the language, its tradition of literacy (if any), and the extent and variety of the literacy practised in it. This combination of "size, status, and standardisation" is intended only as an indication of some of the questions which fall within the recently named field of "sociolinguistics" and which are relevant to the present discussion.

The points of structural (or internal) difference are traditionally central to the science of linguistics. Languages differ from each other in their grammar, vocabulary, and phonology (or sound-structure), and also in their "graphology," that is to say, in the way they are written, or, more technically, in the structure of their writing-systems. It is this last area of difference which is relevant to the word "alphabet."

Typographers, rightly, have their own use for the word "alphabet" as a technical term in typography. This use does not necessarily coincide in meaning with the use made of the same word by linguists concerned with the general study of writing and of literacy, and with the application of these general studies to the practical problems of language standardisation, of orthography design, and of literacy promotion and maintenance.

2.2 The key-term for the linguist engaged in this field is "writing-system: (sense—4 of "writing" in Part I of this paper). Since his science is a general one, the linguist begins by surveying the writing-systems of the world as a whole, in order to classify them. His first classification is usually into "phonological" and "non-phonological." A writing-system which represents, in some way, the sound-structure of its language is a phonological writing-system; one which does not do this is non-phonological (often called, in the past, "ideographic," but this is a misleading name).

The paramount example of a non-phonological writing-system is the traditional writing-system of Chinese. The traditional writing-system of Japanese, also, is largely non-phonological. Even if the two language-communities in question happened to be small and insignificant, the linguist, as a scientist, could not overlook them. As it is, even the smaller of the two communities, Japan, numbers nearly 100 million people, and its level of literacy is one of the highest in the world with a colossal production and consumption of books and newsprint, and a proportionate volume of archives, documentation, exchange of public and private correspondence, and turnover of educational materials. All this has been achieved with the use of a supposedly archaic writing-system. For the modern expansion of literacy in Japan was accomplished in the traditional orthography of Japanese, though the cause of "romanisation" has been pleaded ever since the impact of Western technology in the 1860s and '70s. Non-phonological writing-systems survive only in the Chinese/Japanese corner of the world—but it is a very large corner.

Turning to phonological writing-systems: these are further divided into syllabic and alphabetic, according to the usual classification. The dividing-line between the two is by no means clear, but there are two characteristics which render a writing-system unequivocally alphabetic: they are a strictly limited number of basic symbols, and a full and explicit representation of all vowels. Those phonological writing-systems which do not qualify as alphabetic may be classed as syllabic, though this traditional term is not ideal.

Broadly speaking, syllabic writing-systems serve a considerable number of language communities, both large and small, in Asia

and North Africa, and are associated with the Arabic and Devanagari scripts for the most part, but also with such distinct scripts as the Hebrew and the Ethiopic.

Alphabetic writing-systems are the most prolific and are found throughout the rest of the world, mostly based on roman (Latin) or cyrillic (Russian) alphabets. The reasons for their proliferation and continued productiveness are manifold, and are related to matters of linguistic structure and graphological economy, to psycholinguistic factors concerning the acquisition and exercise of literacy, and to sociolinguistic factors concerning the status of the major European languages and the supply and transmission of written material. On the historical factors concerned with the technology of printing and with the expansion of European culture in association with printing, we need not dwell.

2.3 It is clear that the word "alphabet" needs to be used with great care when the world's writing-systems are considered as a whole. When we analyse the relations holding between individual languages and their established writing-systems, we see that not all these writing-systems are alphabetic, and some are not even phonological, in structure. And though all writing-systems yield, on analysis, an inventory of basic symbols out of which their words are constructed these symbol-inventories cannot all be appropriately called "alphabets." In particular, the word has no application as regards the traditional writing-systems of such important languages as Chinese and Japanese, with their thousands of distinct "characters."

A precise sense can be given to the linguistic term "alphabet" in respect of alphabetic writing-systems: it can mean, quite simply, the *set of letters;* in the English writing-system, for example, the set of 26 letters. In this way the term gains in precision what it loses in generality, for much talk about "alphabets" outside linguistics is not about alphabets but about writing-systems. These are very much more complex entities than alphabets, and the loose use of the word "alphabet" in the sense of "writing-system" conceals this complexity rather than clarifies it.

2.4 Three further considerations may reinforce this argument.

In the first place, we have been speaking of languages and their writing-systems as though each language had only one writing-system, the one often known as the "orthography" or the "standard orthography" of the language in question. In classifying writing-systems, just now, according to their linguistic structure, we were considering only the standard orthographies of languages. But, as we mentioned in Part I, writing-systems can be classified on a quite separate dimension, that of the purpose they serve. This is most clearly illustrated by the existence of shorthand writing-systems, or stenographies, which do not serve the ordinary purposes of literacy, as orthographies do, but are designed for the specialised purpose of fast writing.[6]

In the second place, when we analyse an orthography (or any other kind of writing-system), we never find that it consists solely of its letter-symbols or syllable-symbols or word-symbols (as regards the last, the linguist would speak, more precisely, of morpheme-symbols). Let us take as an example the family of European writing-systems based on the roman alphabet: each of these contains other symbols in addition to the alphabetic ones (the letters), viz., numbers or figures, marks of punctuation, and symbols such as the asterisk, the degree-sign, or (increasingly) the dollar-sign. Their symbol inventories are not confined to the symbols from which their words are constructed (the letters). The symbol inventory is *not* the alphabet.

Much more important—and this is the third point—the symbol inventory is *not* the writing-system. A set of symbols on its own is inert. If the symbols are to represent language, there must be rules for their use. These rules, along with the symbols they govern, constitute the writing-system—rules of spelling, rules of punctuation, the rules which govern the direction of writing, the paragraphing, the word-spacing, the use of figures, of capitals, italics, abbreviations, and so on. "Rules" may seem an over-

6. See David Abercrombie, *Studies in Phonetics and Linguistics* (London: Oxford University Press, 1965), chapter 8, "Writing Systems." Chapters 9, "Isaac Pitman," and 14, "On Writing and the Phoneme: Two Reviews," are also of considerable interest for the present topic.

formal word for the conventions governing some of these features, but there must be regularities governing the use of any graphological device in any writing-system, and in using the writing-system we respond to (in reading) and exploit (in writing) these regularities.

When a child (or an adult) becomes literate, he does not learn just a set of symbols, he learns also a system of rules by which the symbols are related to his language, or to the language in which he becomes literate. He learns, in short, a writing-system—the standard orthography of his language of literacy—and he exercises his knowledge of that writing-system both in reading and in writing (cf. language-skills in Part I). This is not to suggest that knowledge of a writing-system is a sufficient condition of literacy; it isn't, but it is a necessary condition.

2.5 To sum up: the word "alphabet" has, for the linguist, connotations which are too narrow for him to be able to apply it to the concept for which his science has evolved the term "writing-system." On the other hand, in its narrow (and, of course, traditional) sense of a set of letters serving as the basis of phonological writing-systems of a certain type, it can be given a precise role in graphological description for which no other word is so well suited.[7]

7. The problems of the classification of phonological writing-systems are scarcely covered by these brief remarks, the object of which is to indicate that "alphabet" and "writing-system" are not interchangeable terms. The traditional sense of "alphabet" is even narrower than we have suggested, since it means not merely a "set of letters" but a "set of letters in an institutionally accepted order." In this sense the Hebrew and Arabic writing-systems most certainly have alphabets, and this is an important feature of them. If "having an alphabet" is taken as the criterion for the designation "alphabetic," then this classification will be distinct from the one used in this paper, for which the contrast "syllabic/phonemic" might be substituted.

At no point in this paper are we concerned with alphabets as abstract historical entities, a sense found in such sentences as "Languages of Western Europe use the Roman alphabet" or "The Alphabet has spread throughout the world"; though the genetic study of graphological alphabets is as interesting as the genetic study of typographical alphabets. See David Diringer, *The Alphabet* (London: Hutchinson, 1949, 2nd edition) or, smaller, *Writing* (London: Thames & Hudson, 1962).

2.6 Before ending, it must be said that the use of the word "graphology" in this paper is far from traditional. The word has been adopted from the name given to the psychological study of handwriting interpreted as evidence of personality. In this paper it has been used, as a technical term in linguistics, in a much wider sense, in connexion with the language-medium of writing, to parallel the long-established use of "phonology" in connexion with the language-medium of speech.[8]

2.7 The linguist studies writing as a medium of language. Of all the ways of studying writing and its manifestations, his is the most general. All writing-systems fall within his field, and all kinds of writing,[9] handwriting no less than machine-writing (cf., writing-media, in Part I).

It is the same with the linguistic skills associated with this medium of language. The linguist is not the only student of literacy—far from it; but he is the most general, regarding the acquisition and exercise (and indeed the loss) of literacy as manifestations of man's linguistic ability—his faculty of language—to be studied, like all linguistic phenomena, both in the individual and in society.

The many disciplines, theoretical and practical, which deal with specialised aspects of writing and literacy (and of an even wider field of visual communication) will all, one hopes, be represented in *The Journal of Typographic Research*. If the discipline of linguistics may make a contribution at this stage, let it be to encourage that aspiration towards generality without which so many and such diverse disciplines cannot collaborate.

8. The linguistic use of "graphology" will be found in Angus McIntosh, " 'Graphology' and Meaning," *Archivum Linguisticum*, XIII (1961), 107–120; M.A.K. Halliday, Angus McIntosh, & Peter Strevens, *The Linguistic Sciences and Language Teaching* (London: Longmans, 1964); W. Nelson Francis, *The English Language; an Introduction* (New York: Norton, 1963; Toronto: McLeod, 1963); and elsewhere.

9. This expression, "kinds of writing," provides another example of the multiple meaning of "writing," since it might refer to varieties of written texts, or to literary *genres* or styles. This is one of the meanings which we ignored in Part I. The linguistic study of this aspect of writing is sometimes known as"stylistics."

The Standardization of Alphabetic Graphemes

S. B. Telingater

During the historic development of our national alphabets the direct relationship between the sound of the language and its visual symbols has become obscured. The need for a stronger, direct relationship between sound and symbol is discussed; a suggested rearrangement of graphemes within our alphabets is illustrated.

It is difficult for me to shed the impression that our various alphabets have, during their historical development, forfeited their original advantages and have complicated their wide-spread utilization instead of retaining and further developing those advantages. As a result, we are faced today with the question—or challenge—of unification and simplification of the graphemes (*Grafeme*)[1] of

S. B. Telingater's article has been adapted from a lecture given during a symposium at the Hochschule für Grafik und Buchkunst (Leipzig) on February 7, 1968, honoring the 500th anniversary of the death of Johannes Gutenberg. The article is being published concurrently in German in the May 1968 number of *Papier und Druck,* Leipzig.

As a Russian graphic designer speaking to a linguistic/typographic theme, Mr. Telingator prefaced his lecture with these remarks: "I am neither a scientist nor a semasiologist nor a philologist—my field is book design; I am also engaged as a type designer. Questions arise in my work which are not directly related to my profession. It may, therefore, be self-evident that my attempts to express an opinion about some of these problems may lead to certain mistakes since I am not sufficiently proficient in all of the complexities these problems involve. In spite of this, I should like to deal with one of these problems in a very general way—simply as an idea—in the hope that it will be taken up, corrected, and refined by the appropriate specialists."

1. *Grafeme:* a term introduced by the Soviet type designer, Tagirow, denoting the abstract sound symbols of an alphabet (see S. B. Telingater, "Über das Grafem des Alphabets" in *Typografie,* 1965/1, pp. 21-23).

national alphabets which are based on the Roman and the Greek alphabets. The classic foundation of these national alphabets was constructed in such a way that each grapheme was the equivalent of a definite phoneme; or, expressed differently, that each letter denoted a sound.

It is not necessary here to analyze deeply the reasons for this historical development nor the fact that in our contemporary alphabets different relationships between graphemic and phonetic systems have crystallized themselves; but it should be emphasized that the complicated graphemic visualization of some sounds (eaux, a, ch, oi, etc.), the existence of silent letters, or the deviations in the pronunciation of letters in relation to their alphabetic sound value constitutes a certain regress when compared to the simple and clear readability of the Roman and Greek alphabets. There seems to be a certain defect in the historical development of divers sound values of the same letterform (e.g., P-R in the Russian, and P-P in the Latin language). We are faced here with a basically different pronunciation, not merely with a dialectal distinction. One could elaborate on this complex of questions: different phonetic values of the same letter, double recording of the same sound, wrong rhythmic direction in the recording of the graphemes, etc.

In this connection a utilitarian and perhaps not too naive a question should be raised: could man not find ways to correct these historical deficiencies? A radical solution could be the unification of the graphemic systems of those alphabets which are derived from the Roman and the Greek alphabets. Furthermore, the unified, standardized graphemes should be made mandatory for all of the alphabets within the Roman-Greek and Greek-Cyrillic group. The system of diacritical marks should be equally standardized in principle.

The table of graphemes presented here (Fig. 1) is merely an initial step requiring further discussion and development. At the same time I am also recommending a new arrangement of the graphemes within the alphabet, which is dictated by the character of their graphic forms. In this way, one must assume, a certain practical sense of logic would express itself in the arrangement of the alphabet (the precision of the system of graphic construction replaces the historical sequence which lacks any systematization).

Figure 1. Graphemes as proposed by the author and arranged on the basis of the character of their graphic forms.

There is no doubt that the implementation of this idea would, in all practicality, stretch over several generations. Even in the normal process of development, past historical deficiencies would have to be eliminated. Many difficulties would undoubtedly arise; within every language special problems would have to be coped with.

It is certain, however, that the progressive development of history and of mankind is closely related to the peaceful co-existence and the economic and cultural relationships among nations. International tele-communication and travel which

promote such relationships are developing at an accelerated pace. Nobody can deny that the standardization of the alphabet could be of eminent importance in this respect. The rising development of science and technology (faster than we realize) is elevating humanity to a level at which the multitude of different alphabets should be considered a serious impediment for the future progress of civilization on our planet.

The practical implementation of this promising task would undoubtedly have to be performed in tactical stages. These stages might include: elimination of the archaisms in our alphabets and of the silent, unpronounced letters; improvement of the diacritical marking system; standardization of individual letters with national alphabets, etc. A general solution based on territorial or language areas would have to be arrived at after international discussions have taken place.

It is interesting to note that the standardization of alphabetic graphemes on an equal phonetic basis could result in a reduction of text lengths from 20% to 25% in some languages, especially French and English. In this connection, it should be pointed out that this proposal has nothing to do with the ideas of the Esperantists; it confines itself to a reform of alphabetic graphemes and in no way attempts to alter the various national languages.

Phonetists always emphasize the fact that the original forms of the alphabets utilized by us were not derived from a phonetic basis but from a graphic, pictorial one. The signs of the phonetic script had their origins in the hieroglyphs. If one could incorporate the subtleties of human speech and the phonetic richness of our language into the creation of a corresponding alphabet, a multitude of new and useful graphemes and combinations would be the result. But even then, many of the delicacies of phonetic combinations and of other language finesses would be impossible to record. We must bear in mind that any standardization of alphabets should lead to a minimum of graphemes, and all of the general phonetic variations must be expressed through the diacritical system.

Figures 2 through 7 show examples for the standardization of alphabetic graphemes in several languages.

Figure 2. Alphabetic graphemes in German.

Figure 3. Alphabetic graphemes in English.

Figure 4. Alphabetic graphemes in Russian.

Figure 5. Alphabetic graphemes in French.

NARODI OSIÕTNÕ ŞLAHETNI I
NARODY OSIĄGNĄ ŚZLACHÊTNY I

UPRAΓNÖNI CEL - OBROŃÕ POKUÏ,
UPRAGNIONY CEL - OBRONIĄ POKÓJ,

EẐELI Z'EDNOÇÕ SVE VĪSILKI I BẼDÕ
JEẐELI ZJEDNOCZĄ SWE WŸSIŁKI I BĘDĄ

VITRVALE I AKTIVNE VALÇIÇ O POKUÏ I
WYTRWALE I AKTYWŃIE WALCZYĆ O POKÓJ I

PŞIĄZŃ MẼDZI NARODAMI.
PRẐYJĄŹŃ MIĘDZY NARODAMI.

Figure 6. Alphabetic graphemes in Polish.

A NËPEK ELËRIK A BËKE MEΓVEDESENEK
A NÉPEK ELÉRIK A BÉKE MEGVÉDÉSÉNEK

NEMEŞ ËŞ HÖN OOHAĪTOTT
NEMES ÉS HÖN ÓHAJTOTT

CËLĪÄT, HA EĒDEŞÏTETT ERÖVEL,
CÉLJÁT, HA EGYESÍTETT ERÖVEL,

ÄLLHATATOŞAN ËŞ AKTÏVAN
ÁLLHATÁTOSAN ÉS AKTÍVAN

HARCOLNAK A BËKËËRT ËŞ A NËPEK
HARCOLNAK A BÉKÉÉRT ÉS A NÉPEK

BARÄTŞÄΓÄËRT.
BARÁTSÁGÁÉRT.

Figure 7. Alphabetic graphemes in Hungarian.

In the Soviet Union the standardization of the alphabet or the introduction of a unified alphabet could be relatively easy, since one is familiar here with different alphabets. In our country, almost the entire young generation knows the Roman alphabet. One can imagine, however, that the practical implementation of an alphabetic standardization could cause many difficulties in individual languages. In French, for instance, we use the letter s for the plural form. If we let ourselves be guided by the principle that a sound equals a letter, all silent letters should not be written. What about the formation of the French plural in that case? Spoken French may help us here. It must be assumed that a Frenchman—on the basis of the context of the sentence—can understand very well whether a word is used in its singular or plural form, in spite of the fact that the s is unpronounced. Similar examples can also be found in other languages; if we are to hope for solutions to these problems, we must look to the philologists for guidance.

The examples shown here (Figs. 2-7) are, by no means, designed as final solutions to the questions I have raised. They are merely to illustrate the basic idea of my general proposal.

In conclusion, let me suggest that we admit, first of all, that the present form of many national alphabets can on all probability be improved. Once we agree on that, all research people whose work impinges on alphabetic studies would be called upon to participate actively in its continued development and modification on an international cooperative basis.

Translated by Klaus F. Schmidt, Director of Printing Production, Young & Rubicam, Inc., New York; Chairman, Board of Trustees, The International Center for the Typographic Arts, Inc.

Typographic Anamorphosis

Jan Slothouber and William Graatsma

Anamorphosis, an optical phenomenon meaning "return of form," consists in the perception of a deformed figure as a normal figure. An example of letter-anamorphosis recently applied in Holland is discussed and illustrated.

Anamorphosis, an optical phenomenon, means "return of form" and consists in the perception of a deformed figure as a normal figure. If you slowly turn a portrait photograph (after viewing it from in front) on its horizontal axis so that its front is only just visible, you perceive a deformed figure of reality, a flattened figure, as it were.

Anamorphosis is exactly the reverse phenomenon.

Suppose you have a photograph of such a flattened figure and you turn it slowly on its vertical axis so that its front is only just visible. What you perceive then is the real figure of a distortion in which the original form returns. Thus, anamorphosis is perception of reality by means of a deformed figure.

This phenomenon was put to use in mural and other paintings as far back as the sixteenth century (Fig. 1). The figures applied are so much distorted that when seen from in front they become unrecognizable. If, however, you look from a distance at an angle you will see a clearly recognizable presentation in perfectly real figures. All kinds of curved and non-curved surfaces were thus provided with paintings. The particularly ingenious projections that had to be made for these purposes still deserve our admiration.

A Dutch traffic sign for bicycles is an example of contemporary use of anamorphosis (Fig. 2).

Another example is the letter-anamorphosis designed by the authors of this article which has been recently applied at the DSM (chemical industries) head office in Holland (Figs. 3 & 4). It was desirable for

Figure 1. Anamorphosis portrait of King Edward VI of England (1537–1553). Artist unknown. Top: as seen from the front; bottom: as seen from the side. © National Portrait Gallery, London.

the monotony to be relieved in a long (36 meters) and narrow (1.4 meters) communication passage between two divisions, e.g., by hanging photographs. However, nothing would come of viewing wall photographs in such a busy passage while passing at a distance of barely one meter. By applying the letter-anamorphosis "DSM," the disadvantage of an elongated space was turned into an advantage. When you enter, the letters "DSM" are clearly legible, and when you are passing, the letters themselves are not recognizable. This is a curious sensation which makes the space more interesting.

REFERENCE

Jurgis Baltrusaitis, "Anamorphosis," *Collection Jeu Savant* (Paris: Olivier Perrin Editeur, 1955).

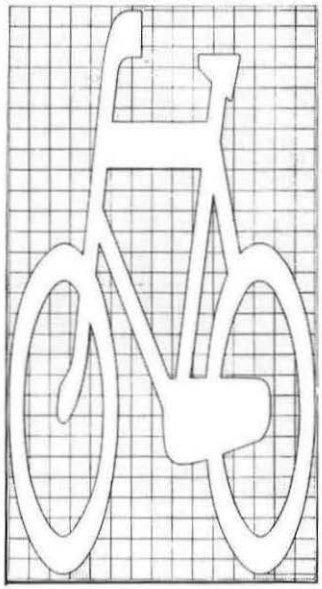


Figure 2. Dutch road sign
(*Netherlands State Journal*, No. 3, 1967).

Figure 3.
Letter anamorphosis
at DSM, 1967.

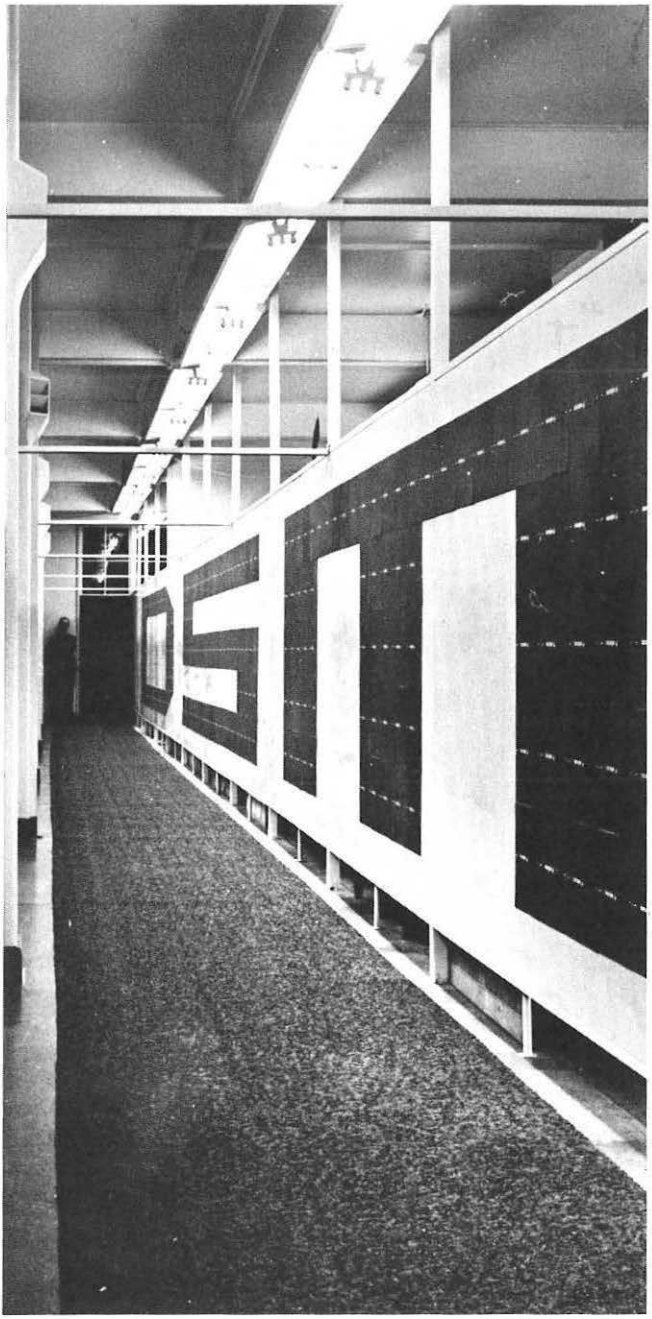


Figure 4. Letter anamorphosis as installed at DSM.

Towards a Standard for Measuring the Accuracy of Any Computer-hyphenation Program

Dwight D. Brown

No standard of measurement yet exists to measure computer hyphenation accuracy. The author discusses the need for such a standard; among considerations discussed are: word frequency, hyphenation probability, inter-word spacing, and line expansion factors. Very high hyphenation accuracy can be obtained if the computer program can select the words it chooses to hyphenate without being "chastised" for failing to hyphenate where hyphenation is possible. The author presents a series of formulas for arriving at hyphenation accuracy ratings in different publishing environments and for measuring "positive" and "negative" hyphenation errors.

Due to the widespread application of digital computers to text processing applications and the concomitant requirement for the division of words at the end of a line, a number of computer techniques for the division of words have been developed. With the advent of high-speed photo composition devices and more powerful and inclusive typesetting computer programs, high quality computer hyphenation becomes an absolute necessity.

At present there is no standard for measuring the accuracy of computer hyphenation. Selection between various techniques and the effects of changes on a particular technique cannot be effectively measured.

If one were to adopt the convention of dividing correct hyphenations by the total of attempted hyphenations to arrive at the accuracy percentage, 100% accuracy could be obtained by storing one word in the computer and not attempting to hyphenate any others.

While no one has approached this degree of statistical flagrancy, measurement figures have been quoted which did not deduct from a program's accuracy rating for failure to hyphenate

when hyphenation was indeed possible. If accuracy ratings are directed toward the measurement of a program's accuracy for typesetting, there are several things which should be taken into consideration. Among these are:

Frequency. Any attempt to measure hyphenation accuracy without taking usage frequency of the words into consideration would be misleading to a typesetter. Correct hyphenation of such words as "medium," "likely," or "picture" is much more important than the proper hyphenation of words such as "languor," "maxixe," or "epicene." Any accuracy measurement technique should take frequency of use into consideration.

Word Length as a Function of the Average Number of Characters Per Line. Consider a set of characters, all of which have the same width, as on a computer printer. Also assume that a column width equal to 40 character positions is to be set. Since over 99.98% of all words are less than 20 characters in length, let's consider only words of fewer than 20 characters. Neglecting certain fringe effects at the beginning of a line, the chances are approximately equal that a word will begin in any of the 40 character positions, except for the second one. This is, of course, for lines as presented to the computer before hyphenation or justification have been performed.

A word can never be a candidate for hyphenation unless one or more of its characters extend past the fortieth character position. Therefore, the probability of a word being a possible candidate for hyphenation can be expressed as a function of the number of characters in the word and the number of characters in the line. In a 40-character line, a word could begin in any of 39 positions (in any position except the second one). A five-character word could become a candidate for hyphenation by beginning in any of the last four positions of the line. Therefore, a five-character word would have four chances out of 39 of being a candidate for hyphenation provided it appeared once, and only once, in the line. Figure 1 shows the probability of a word being a contender for hyphenation as a function of the number of characters in the word and the number of characters in the line. The graphs in Figure 1 illustrate one reason for placing greater emphasis on longer words when measuring hyphenation accuracy.

FAMILY OF LINES PLOTTING P_c vs WORD LENGTH FOR VARIOUS LENGTH LINES

Where:

X = Number of characters in word.

C = Number of characters in line.

P_c = Probability of a word being a possible contender for hypenation. (extending over the end of the line)

This probability P_c (neglecting the case of a word appearing more than once in the line) is given by:

$P_c = (X - 1)/(C - 1)$ except where C is less than or equal to X, in which case $P_c = (X - 2)/(C - 1)$.

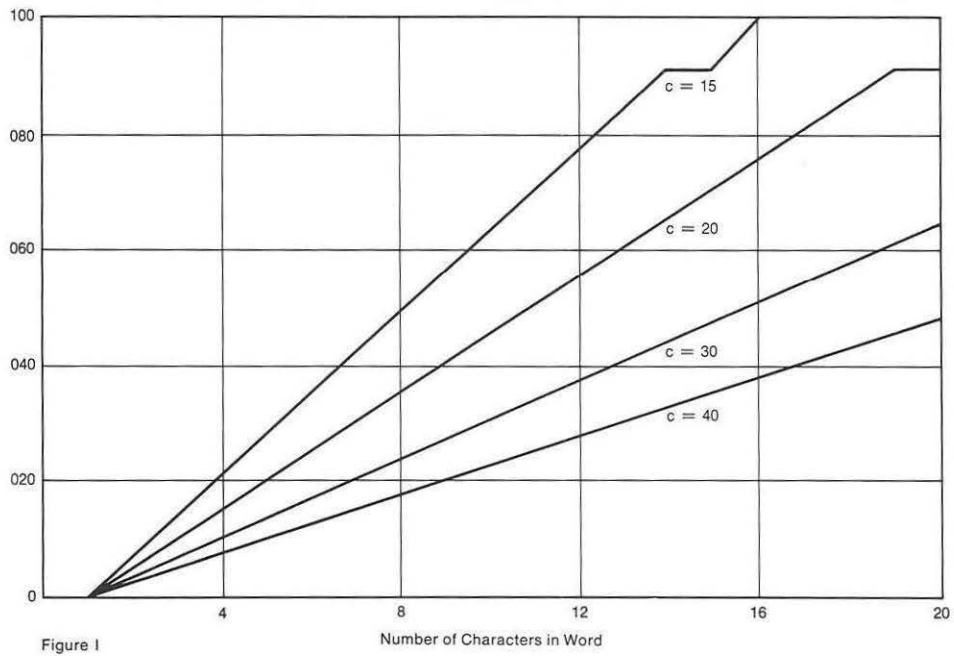


Figure 1

Figure 1. Word hyphenation probability as a function of number of word characters and number of line characters.

Number of Spaces in the Lines and Spaceband Expansion. Hyphenation becomes a typesetting requirement when the inter-word space expands past some graphic quality value.

The fundamental reason for syllabification, in a typesetting application, is to avoid excessive inter-word spacing. This spacing can be expressed as the expansion of the minimum inter-word space. For example: an expansion factor of 1.5 merely states that each inter-word space must be expanded to 1.5 times its minimum value to obtain justification. Some expansion limit is normally reached before hyphenation will be attempted. That is, if the over-extending word is carried to the next line and the expansion factor is still less than the value set up (usually 1.7), no hyphenation need be attempted. This expansion factor is given by the formula

$$E = \frac{S + (X + 1)}{S} = 1 + \frac{X + 1}{S} \qquad [1]$$

E = expansion factor

S = minimum width of all spaces in the line

(X+1) =Line deficit (amount of excessive space remaining in the line after the over-extending word has been taken to the next line.) X is the minimum number of characters which must be carried to the next line to exceed E. The space which would have preceded the character group taken to the next line is accounted for by the "1" added to X.

The application of this formula results in a series of graphs (shown as Figure 2). These graphs illustrate the effect of the type of work being set on the importance of word lengths as pertains to hyphenation.

For example, a job requiring 10 spaces per line and permissible inter-word spaces of 1.7 will never require hyphenation of words fewer than seven characters in length.

Since about 63% of all words greater than four characters in length, by frequency of use, are between five and seven characters in length, an accuracy rating which included words in this length range would be meaningless to a typesetter who specializes in wide-measure work. For example, a hyphenation program could

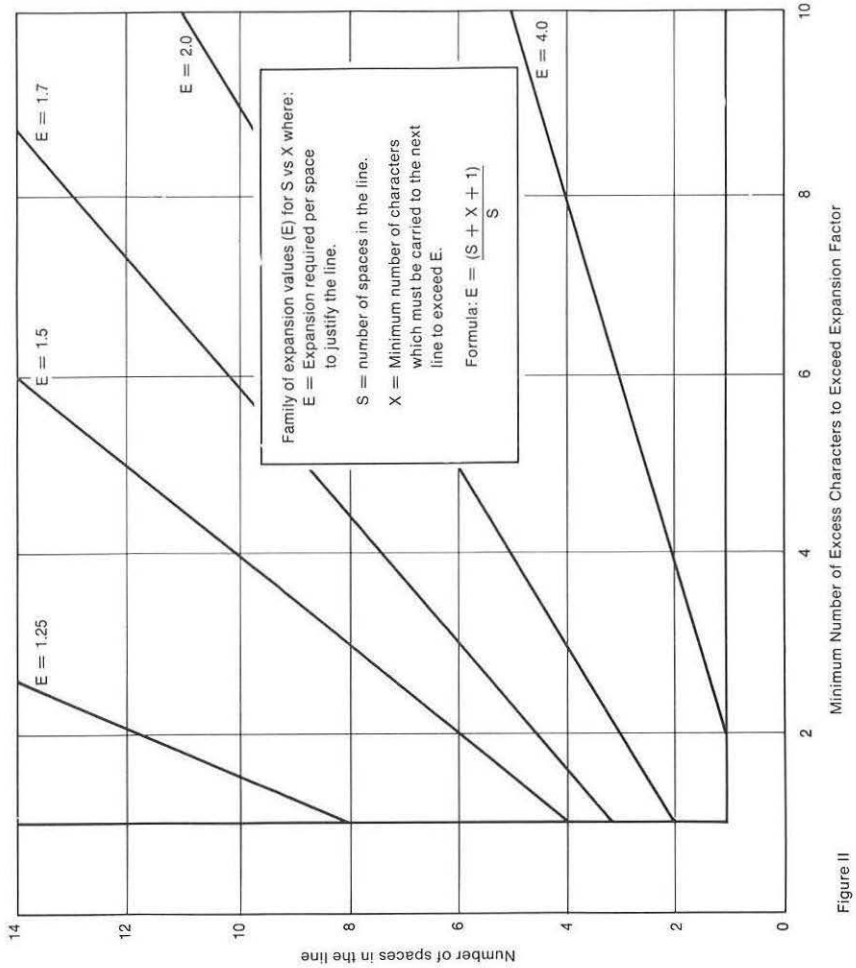


Figure II

Figure 2. The effect of the type of work being set on the importance of word lengths as pertains to hyphenation.

correctly hyphenate all the words of less than seven characters and two-thirds of the others for an accuracy rating of 87.42%, but the true accuracy rating would be 66.6%. A meaningful accuracy rating must take into consideration the type of work being set.

A combination of the technique used in generating Figure 1 and the result of Figure 2 produces the probability of the word being hyphenated as the function of the type of work being set and the length of the word. This is shown for an expansion value of 1.7 in Figure 3.

Figure 4 shows the word "accomplished" falling into the latter positions of a 40-character line. If expansion of less than 1.7 is permissible, and a column width of 40 characters is to be set, excess space equal to at least five character positions must be distributed among the spaces to equal or exceed the 1.7 limit. Therefore, "accomplished" would be hyphenated if—and only if—it began in positions 30-36. If it begins past position 36, less than five character positions will have to be distributed, resulting in an expansion factor of less than 1.7. If it begins prior to position 30, the entire word will remain on the line.

The word "accomplished" has seven chances in 39 of being hyphenated under the graphic conditions given. This is equal to a probability of about 18%.

The results shown in Figure 3 were derived by application of the formula:

$$P_h = \frac{L - X}{C - 1} \qquad [2]$$

P_h= probability of a word being hyphenated, given that it appears once and only once, in a line.

L = length of word

C = number of characters in the line

X = number of excess characters required to exceed the expansion factor (from Figure 2)

This formula holds, providing the line length is long in relation to the word length. The formula does not hold true as the word length approaches the line length.

E = Expansion factor = 1.7

$$P_h = \frac{L - X}{C - 1} = \frac{L + 1 - S(E - 1)}{C - 1}$$

WHERE: P_h = probability of a word being hyphenated, given that it appears once and only once, in a line.
L = length of word.
C = number of characters in the line.
X = number of excess characters required to exceed the expansion factor.
S = Number of spaces in the line.
E = allowable expansion factor value before hyphenation need be attempted.

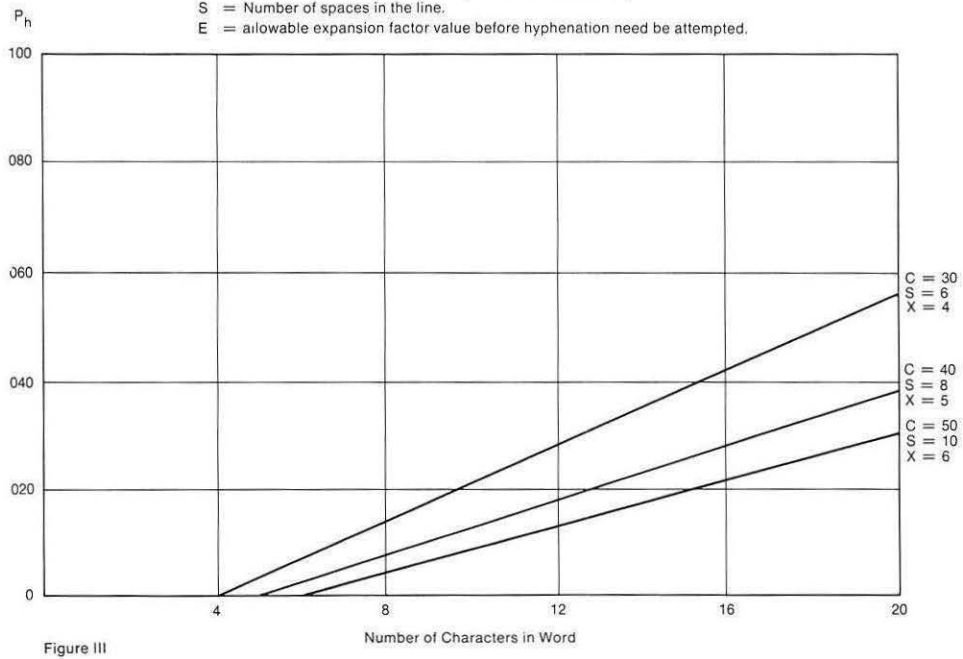


Figure III

Figure 3. Word hyphenation probability as a function of type of work being set and word length.

1	2	3	.....	29	30	31	32	33	34	35	36	37	38	39	40	(positions on 40-character line)
				A	C	C	O	M	P	L	I	S	H	E	D	
					A	C	C	O	M	P	L	I	S	H	E	D
						A	C	C	O	M	P	L	I	S	H	E D
							A	C	C	O	M	P	L	I	S	H E D
								A	C	C	O	M	P	L	I	S H E D
									A	C	C	O	M	P	L	I S H E D
										A	C	C	O	M	P	L I S H E D
											A	C	C	C	O	M P L I S H E D
												A	C	C	C	O M P L I S H E D
													A	C	C	C O M P L I S H E D

Figure 4. Given an expansion factor of 1.7, the word "accomplished" has a hyphenation probability of 18% in a 40-character line.

The relationship between X and the graphic parameter E and S was given by [1]. This formula may be rearranged so that X is expressed as:

$$X = S(E - 1) - 1 \qquad [3]$$

This formula can be substituted into [2] yielding

$$P_h = \frac{L + 1 - S(E - 1)}{C - 1} \qquad [4]$$

This formula expresses the probability of a word being hyphenated as a function of its length and the parameters of the job to be performed.

The only variable, once the graphic parameters of the job have been defined, is the length of the word. This formula can easily be applied and may be expressed as a function of length plus constants.

This formula results in a weighting factor which should be applied to the word being hyphenated. The frequency of use of a word gives a fairly accurate picture of the number of times a word would occur in a given job. The probability P_h gives a representation of the number of times, per 100 occurrences, that the word will be hyphenated.

Therefore, the writer proposes that the hyphenation accuracy rating should use the frequency of use of a word times P_h (for the length word in that typesetting environment) to arrive at the weight given to the word as far as hyphenation accuracy is concerned.

Type of Hyphenation Errors

Two types of hyphenation errors commonly occur. These have been characterized as "positive" and "negative." A positive hyphenation error is said to occur when the computer program picks an incorrect point. A negative hyphenation error occurs when the computer program does not hyphenate a word even though a correct breaking point exists.

Hyphenation accuracy measurements should take both types of errors into consideration. Many newspapers feel that the positive errors are the most serious since they cause the resetting of two or

more lines. The introduction of negative errors results in poor graphic quality and excessive letterspacing, but need not require corrective measures. Very high accuracy figures are possible, with mediocre program techniques, if negative errors are not counted. It may also be possible to row, row, row your boat down rivers of white space.

Book publishers and job shop printers cannot, however, tolerate poor graphic quality. Negative errors are just as pernicious, in this environment, as positive ones.

Why Measure Accuracy More Accurately?

This article has sought to explain some of the considerations which should go into hyphenation accuracy measurements. If a standard encompassing these "on the job" considerations could be agreed upon, it would serve at least three purposes:

1. Give typesetters a meaningful yardstick with which to measure a computer program's performance.

2. Allow computer programmers to determine the effect of hyphenation program changes as they affect the actual job to be performed, rather than measuring these changes in terms of such irrelevant criteria as percentage of total words hyphenated correctly. A program change could easily increase the accuracy figure attained against a dictionary while decreasing the program's actual on-the-job accuracy.

3. Allow the "tailoring" of hyphenation (rules) to the type of job to be performed. This will allow hyphenation programs to be tailored to a specific type of publisher according to his individual needs, rather than supplying one general program trying to be all things to all people.

Toward these objectives the following method of determining the hyphenation accuracy of any computer program is proposed:

1. Obtain a representative sample of the words being set in the typesetting environment in which the program is to be used. This may be accomplished by simply collecting TTS tape, over a period of time, and then putting the words (text between spacebands) on magnetic tape or some other form of computer storage.

2. Next, sort these words, deleting duplicates but maintaining a count of the number of duplicates found for each word. This count then becomes "raw" frequency count for that word.

3. Determine the typesetting environment in terms of:
(a) Average number of characters in the lines to be set,
(b) Average number of spaces in the lines to be set,
(c) Expansion factor allowed before attempting hyphenation.

4. Substitute the values found in 3(a), 3(b), and 3(c) into formula [4] to arrive at a value of P_h for various length words.

5. Multiply the frequency count obtained in [2] by the value of P_h (depending upon the length of the word) found in (number 4). If P_h is negative, give it a value of 0.

6. This now provides a word sample which is weighted by frequency as well as typesetting environment.

Steps 1 through 6 could be performed by the typesetter wishing to obtain hyphenation accuracy information as it pertains to his particular job, or better still by some agency of the graphic arts industry such as a research council.

If an agency were to perform this function, it could collect samples of words from various classes of typesetting jobs and maintain these by types of jobs such as "medical," "news magazines," "newspaper," etc. If these magnetic tapes were kept with "raw frequency" information rather than "environmentally weighted frequency," they could be used to produce tapes for any typesetting environment. This could be accomplished by simply adding the values of those considerations mentioned in 3(a), 3(b), and 3(c) above and running this data against a program which would apply formula [4] to produce a new tape. This new tape would then contain the "environmentally weighted frequency" count.

The "environmentally weighted" tape, of the types of words to be analyzed, would form the input sample for the hyphenation program and hyphenation accuracy measurements.

Let's call this environmentally weighted frequency F_{ew}.

This master dictionary, properly hyphenated and with F_{ew} for each word, would then be hyphenated by the program technique under consideration. If the following statistics were maintained, the program accuracy, attributes, and shortcomings could be better evaluated.

Counters should be maintained for the following:

1. The number of hyphens in each master dictionary word is

multiplied by F_{ew} for that word and this quantity is then added into a counter. Let's call this counter "A."

2. The computer hyphenated word is compared to the master dictionary hyphenation and a number of points which match are counted. This number is multiplied by F_{ew} of that word and the resulting quantity is added into another counter. Let's call this counter "B."

3. The number of points in the computer hyphenated word which did not match the master dictionary hyphenation are counted. This number times F_{ew} are added into a third counter. Let's call this counter "C."

4. The number of hyphens chosen by the computer and the number of hyphens in the master dictionary word are compared.

a. If the number of hyphens in the computer hyphenated word exceeds the number in the master dictionary word, the difference times F_{ew} is placed into a counter. Let's call this counter "D."

b. If the number of hyphens in the master dictionary word exceeds the number the computer program chose, the difference times F_{ew} is added into another counter. Let's call this counter "E."

These counters, after the sample words have been hyphenated by the computer, will allow the calculation of several ratios to pinpoint a program's characteristics (Figures 5 and 6). The following ratios should be computed:

$$\text{Ratio}_1 = \frac{\text{Total B}}{\text{Total A}} \times 100\% = \text{percentage of total correct}$$

hyphens chosen (weighted by F_{ew}). This ratio, taken alone, is in no way indicative of a program's performance if the percentage is high. If it is low, it indicates poor performance but does not show why.

$$\text{Ratio}_2 = \frac{\text{Total C}}{\text{Total A}} \times 100\% = \text{percentage of positive hyphena-}$$

tion errors. This percentage may exceed 100% if the program chooses too many points.

$$\text{Ratio}_3 = \frac{\text{Total D}}{\text{Total A}} \times 100\% = \text{percentage over-hyphenation.}$$

COMPUTER HYPHENATED	MASTER DICTIONARY	F_{ew}	COUNTERS				
			A	B	C	D	E
COMPU - TER	COM - PU - TER	100	200	100	0	-	100
COM - MON	COM - MON	300	300	300	0	-	-
AC - CEPT	AC - CEPT	500	500	500	0	-	-
SUPPER	SUP - PER	100	100	0	0	-	100
A - BA - BA	A - BA - BA	10	20	20	0	-	-
MA - XI - XE	MA - XIXE	10	10	10	10	10	-
REG - IMENT	REG - I - MENT	20	40	20	0	-	20
FEB - RU - ARY	FEB - RU - ARY	300	600	600	0	-	-
TOTAL			1770	1550	10	10	220

$RATIO_1 = 87.6\% = \frac{\text{Total B}}{\text{Total A}} \times 100\%$ $RATIO_3 = 0.6\% = \frac{\text{Total D}}{\text{Total A}} \times 100\%$

$RATIO_2 = 0.6\% = \frac{\text{Total C}}{\text{Total A}} \times 100\%$ $RATIO_4 = 12.4\% = \frac{\text{Total E}}{\text{Total A}} \times 100\%$

Figure 5. Sample computer hyphenation program technique number 1.

Figure 6. Sample computer hyphenation program technique number 2.

COMPUTER HYPHENATED	MASTER DICTIONARY	F_{ew}	COUNTERS				
			A	B	C	D	E
C-O-M-P-U-T-E-R	COM-PU-TER	100	200	200	500	500	-
C-O-M-M-O-N	COM-MON	300	300	300	1200	1200	-
A-C-C-E-P-T	AC-CEPT	500	500	500	2000	2000	-
S-U-P-P-E-R	SUP-PER	100	100	100	400	400	-
A-B-A-B-A	A-BA-BA	10	20	20	40	40	-
M-A-X-I-X-E	MA-XIXE	10	10	10	40	40	-
R-E-G-I-M-E-N-T	REG-I-MENT	20	40	40	100	100	-
F-E-B-R-U-A-R-Y	FEB-RU-ARY	300	600	600	1500	1500	-
TOTAL			1770	1770	6780	6780	

$R_1 = 100\%$ $R_3 = 32\%$

$R_2 = 32\%$ $R_4 = 0\%$

$$\text{Ratio}_4 = \frac{\text{Total E} \times 100\%}{\text{Total A}} = \text{percentage under-hyphenation.}$$

Knowledge of these ratios for various hyphen techniques will allow a meaningful comparison of those techniques.

For example, a high value for both 1 and 2 indicates very poor program performance resulting from over-hyphenation. Good program performance is indicated by a high value of 1 and a low value of 2. If ratio number 1, alone, were used, as has been the case with certain measurements taken in the past, a perfect score should be obtained by simply placing hyphens after every letter in the word except the last one. This problem would have been easily pinpointed by examination of ratios 2 and 3.

One of the more prevalent problems in most hyphenation techniques will be spotted by ratio number 4. This pinpoints a program's "reluctance" to hyphenate words it is not "sure" of. Very high hyphenation accuracy can be obtained if the program can select the words it chooses to hyphenate without being "chastised" for failing to hyphenate where hyphenation is possible.

The accompanying sample word lists, showing simulated computer hyphenation as well as master dictionary hyphenation for various hyphenation technique shortcomings, should pinpoint the importance of knowing these ratios when evaluating a hyphenation program's accuracy.

Pictures to be Read/Poetry to be Seen

Jan van der Marck

Language and pictorial representation are increasingly being fused in contemporary visual arts. This trend toward a visual language—poetic rather than communicative—reflects a breakdown of tradition in all the arts. It is discussed and illustrated in terms of the work of specific artists brought together in an exhibition at the Museum of Contemporary Art, Chicago.

The title "Pictures to be Read/Poetry to be Seen" attempts to paraphrase, but by no means defines the subject of this exhibition.[1] The inversion of *Read* and *Seen* is a mere allusion to the breakdown of traditional categories in all the arts. What sets reading apart from seeing is that the former involves time and direction while the latter is instantaneous and wholistic. Words as a temporal element increasingly invade the spatial domain of the image.

If we consider language and pictorial representation as two species of the genus *sign,* they can be wedded with varying degrees of intimacy, either conveniently, by matching illustration to text, or so completely that individual identities are no longer discernible. What characterizes the majority of works in this exhibition is their complex permutation of words and images. The resulting visual language tends towards poetic rather than communicative functions inasmuch as the artist's attention focuses on the sign itself rather than on what it signifies. The meaning of a work is to be found in its overall perceptual organization and not necessarily in its potential to convey information.

The liaison of visual and descriptive elements has become a distinctive

1. Jan van der Marck's article originally appeared as the catalog introduction for the exhibition Pictures to be Read/Poetry to be Seen, organized by the Museum of Contemporary Art, Chicago (Fall 1967).

trend in recent art. The tendency toward visualization of music and poetry has a counterpart in the growing emphasis on narration in painting. Critics have variously identified it as "Figuration Narrative" (Gerald Gassiot-Talabot) and "Immagine Fredda e Poetica" (Arturo Schwarz). Although applicable, up to a point, these terms fail to take into account different but related propositions advanced by Allan Kaprow and Wolf Vostell or Alison Knowles.

More important to the subject of this exhibition than the joint occurrence of words and images is the nature of their relationship and their extension in space and time. Arakawa's diagrams which exist on the borderline between word and image are as pertinent on account of their metaphysical references to space and time, as Kaprow's *Words* and Knowles' *Big Book,* which actually operate in space and time. In analyzing the nature of the varied word-image relationships we discover that the artists in this exhibition have treated them in terms of simultaneity rather than causality, association rather than equivalence, effectiveness rather than sense. The result is pseudo-legible in that it frustrates reading or offers multiple readings; further, it is alogical, discontinuous, non-sequential, and non-explicit. Because of the deliberately complex interrelations between pictorial and literary sign systems, and the absence of reading direction and reference points, the works presented invite speculation but resist interpretation.

A written story this hermetic would remain incomprehensible for the lack of a "code." Works of visual art, on the contrary, still stimulate, aesthetically and intellectually, even though they allow only partial decoding. Their surface coherence overrides content and message and they act like linguistic prisms, refracting and scattering visual information with disregard for immediate comprehension. Assuming a certain amount of shared information, the artist presents us with elaborate stratagems that engage the mind, the eye, and the imagination.

Marcel Duchamp was the first artist to attempt and achieve a visual integration of the work of art with non-art elements from the surrounding world. In his *Large Glass* (1915–23) the pictorial composition and the activity behind the transparent picture plane are fused as we view it. Because the subject is painted on glass, the background is supplied "ready-made" and each situation presents a new context for the painted elements. This open-ended work, capable of absorbing its chance environment, has fascinated artists for half a

Figure 1. *Large Glass (The Bride Stripped Bare By Her Bachelors, Even)*, 1915–1923, by Marcel Duchamp.

century and it is particularly pertinent to this exhibition. We find the same attitude of combined attachment and detachment on the part of the artist, the same irreverent attitude toward the idea of art as precious and unique, the same delight in destroying conventional meanings and substituting new or counter meanings for them, and the same attack on our intellectual and perceptual faculties.

The *Large Glass* has inspired Arakawa's diagrammatic divisions of the canvas into imaginary spatio-temporal and sensorial-psychological zones; Baruchello's stratification of meaning by spreading his cryptograms and micro-images over several layers of plexiglass; Bauermeister and Brecht in their exploitation of the "double imagery quotient" (i.e. the fact of one image being contained in another) in either an illusory or literal way; Fahlström and Simonetti in their topographical organization of images on neutral backgrounds and their use of game structures and chance imagery. Duchamp's proposal of the "assisted ready-made" is crucial to the work of Ray Johnson whose fondness for combs is just one of many tributes; Kitaj treats obscure texts and photographs as ready-mades and juxtaposes this found imagery in a non-sequential way; George Brecht poses the logical question whether the "assisted ready-made" concept would not also apply to literature, the theater and perhaps life itself.

John Cage, through his work, his teachings and his friendships, is another major influence on the artists in this exhibition. Paralleling Duchamp's integration of art and environmental phenomena in the *Large Glass,* Cage admits integration of accidental, external sounds in his musical compositions. The shift of emphasis toward non-auditory elements in his concerts reflects painting's increasing incorporation of non-painterly elements. Cage advocates above all the elimination of boundaries between art and life and he favors chance operations and indeterminacy over conscious composition. He agrees with Marshall McLuhan that in the electronic age everything happens at once, that communication has shrunk the world into a global village. Music, therefore, is no longer a "stream falling over rocks," proceeding from start to finish, but a "vibration complex" as James Tenney has put it. Similarly, art, formerly a definable individual expression is now a multi-focus, total-field experience. George Brecht, on whom Cage left an indelible impression (other artists influenced by Cage are Bauermeister, Fahlström, Johnson, Kaprow, Knowles and Simonetti), predicts a

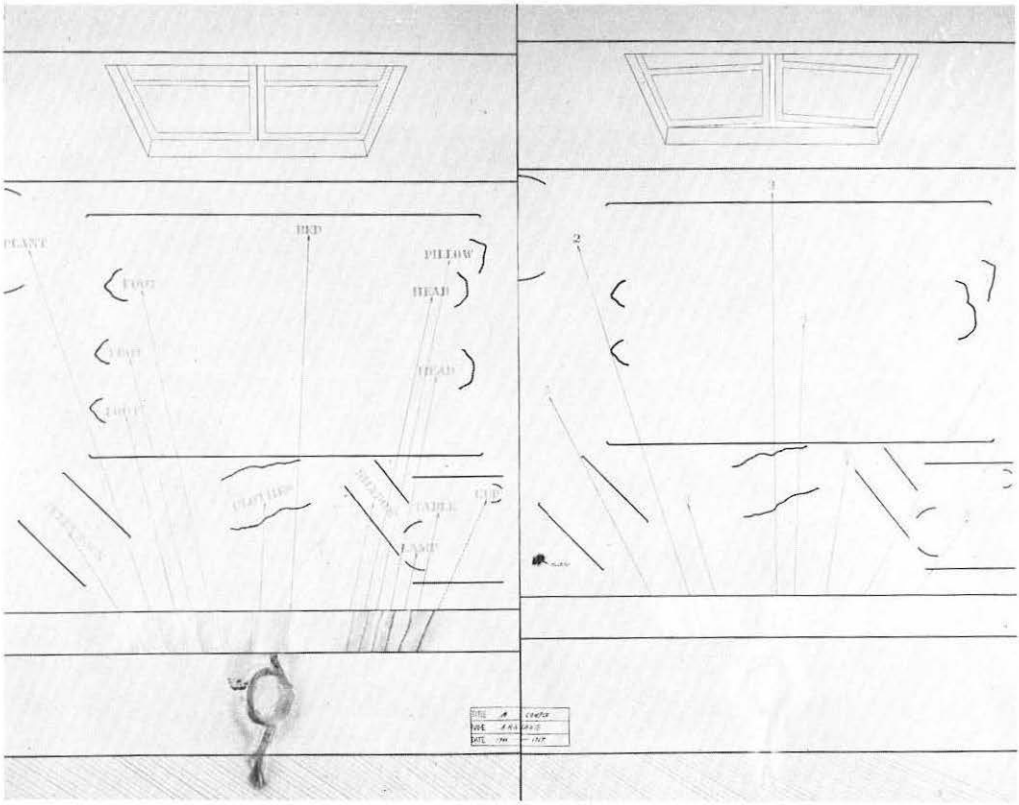


Figure 2. *A Couple,* 1966–1967, by Shusaku Arakawa. Courtesy of the artist and Dwan Gallery, New York. Arakawa says he wants to make "diagrams of the unknown," discover the essential relationship between imagination and reality, trace the sources of the imagination, and propose a reality that exists only as a name. That he would present the seven-letter word MISTAKE as a picture indicates that Arakawa's investigations extend beyond semantics or linguistic analysis. Rather, he is declaring summarily that the world is a flawed environment and life is an unaccountable passage in the continuum of death. . . . Arakawa believes that his paintings can be explained like poetry. By describing their genesis he facilitates our reading. First he makes a sketch (pre-image) of nature by translating it into language. With words that correspond to facts he draws a diagram of the *visible* world. Then, with words that correspond to feelings or ideas, he draws a diagram of the *invisible* world. The painting's effectiveness depends on the artist's ability to establish a connection between the *visible* and the *invisible,* allowing us to "see his feelings . . . touch them and know what they are." (JvdM)

Figure 3. *Three of Swords,* 1966, by George Brecht. Courtesy of the artist and Fischbach Gallery, New York. George Brecht investigates the relationship between words and objects by making signs and wall hangings that spell SILENCE and NO SMOKING. In *The Book of the Tumbler on Fire,* a continuing work begun in 1964 of which eight chapters and over 200 pages have now been completed, Brecht "researches the continuity of un-like things, of objects, of events in time, of objects and styles, etc." Brecht does not admit to the conventional distinctions of media and to him they have already ceased to exist. Subscribing to Cage's ideas about indeterminacy, he writes "event pieces" that may be composed of as little as one word (e.g., EXIT). Like Marcel Duchamp he isolates things that appeal or simply occur to him. Since all these objects relate to his experience, the result capsules the world in terms of autobiography. Thus, his works are personal entries in the book of painting, forever preserved under glass in shallow boxes. . . . At his most effective, Brecht demonstrates the gap between the verbal and the objective level of the things he combines and arranges, and he shows us the fatal inadequacy of word and thing equations. (JvdM).

future state of mind in which divisions within the arts and between art and life no longer exist.

In the field of linguistics this attitude is shared by Ludwig Wittgenstein who commands attention among artists disproportionate to the technical nature of his writings. Unlike the positivists who analyzed what could be said in an ideal language, Wittgenstein concentrated on what is said in actual language. If, in his earlier writings, he contended that language was an exact picture of reality, later, aware of the various language uses, he reevaluated it as a pawn in an indefinite number of language games. His aphoristic arguments have been relieved of their philosophical burdens, as his vivid, rather plastic imagery (chess boards, graphs, pencils, apples, number series) ceased to serve a demonstrative purpose. There is an obvious appeal in such opaque or categoric statements of Wittgenstein's as "What expresses itself in language, we cannot express by means of language," and "What can be shown cannot be said." Wittgenstein has lifted language from its restrictive mold much as Duchamp has freed art and Cage has freed music. His motive was delightfully pragmatic: to someone asking him "What is your aim in philosophy?" he replied, "To show the fly the way out of the fly bottle."

The greatest breakthrough in the use of media and the commingling of art and life came with Allan Kaprow who acknowledges a debt to Duchamp and Cage. In Kaprow's view there are no clear distinctions between drawing and painting (cf. Arakawa, Baruchello, Bauermeister, Simonetti), painting and collage (cf. Johnson), collage and assemblage (cf. Bauermeister, Nutt), assemblage and sculpture (cf. Brecht, Fahlström), sculpture and environmental sculpture; between environmental sculpture, displays and stage-sets (cf. Brecht, Knowles); between these and environments (cf. Kaprow's own *Words*); between art of any kind and life. In a recent article on experimental art Kaprow asserted that "the American melting pot has become a global stew, and the American mind an assemblage."

In the late 1950s Kaprow expanded his art of wall hung assemblages into an art of environment, including light and sound. Attempting to

Text continues on page 270.


WORDS. WORDS. WORDS.
READ LISSEN LISSEN
ON RECORDS READ EM
PLAY. PLAY. PLAY.
ETRY
PLE EM
VOICE WORD
STRIPS PUT
EM OVER
OTHERS
MY EYES
WHIFF OF TIME
ALAS SOON
THE ELEGY
SO SAD
MY HAIR
MOTHER DEAR
REMEMBERING
THE END?
SOFTLY SOTLY
WOW!
WHAT FROST
THE FAR AWAY
A SIMPLE A
TOMORROW
WHAT? WAT?
WAY ABOVE
SURELY NOT
NARROW
CLASSIC
LINUS
CHEAT
CATTLE
BITCH
KINETIC
GATE
WAVES
MNEMONIC
SHOOT
RINSE
CAT
FICK

Figure 4. *Words,* a 1962 environment, by Allan Kaprow. Courtesy of the artist and Smolin Gallery, New York.

About *Words: Words* is an "environment," the name given to an art that one enters, submits to, and is—in turn—influenced by. If it is different from most art in its impermanence and changeableness, it is like much contemporary work in being fashioned from the real and everyday world, a world it celebrates, probes, comments on, perhaps, and surely dreams about.

I am involved with the city atmosphere of billboards, newspapers, scrawled pavements, and alley walls, in the drone of a lecture, whispered secrets, pitchmen in Times Square fun-parlors, bits of stories and conversations overheard at the Automat. All this has been compressed and shaped into a situation which, in order to "live" in the fullest sense, must actively engage a visitor.

This may be difficult for those bound by the habits of respectful distance essential for older art. But if we temporarily put aside the question of the sacred in aesthetic matters and see in *Words* activities analogous to some in which we might normally engage—doodling, playing, anagrams, or scrabble, searching for just the right word to express a thought, climbing a ladder to hang a picture on the wall, listening to records, leaving notes for someone—then the accessibility of the work may get across and its art as much as its mystery becomes apparent. I doubt that mere passive observation is very rewarding.

Of course, being active, we can misuse any environment, natural or artistic. We can destroy a landscape through carelessness, and here we can refuse to consider what responses are appropriate to the nature of the idea. For instance, it is inappropriate to staple word-strips askew, onto the floor or anywhere in the smaller room; and it would be just as unfit to write with the colored chalks in the larger room. There are freedoms for the visitor (as there are for the artist), but they are revealed only within the limits dictated by the art work's immediate as well as underlying themes.

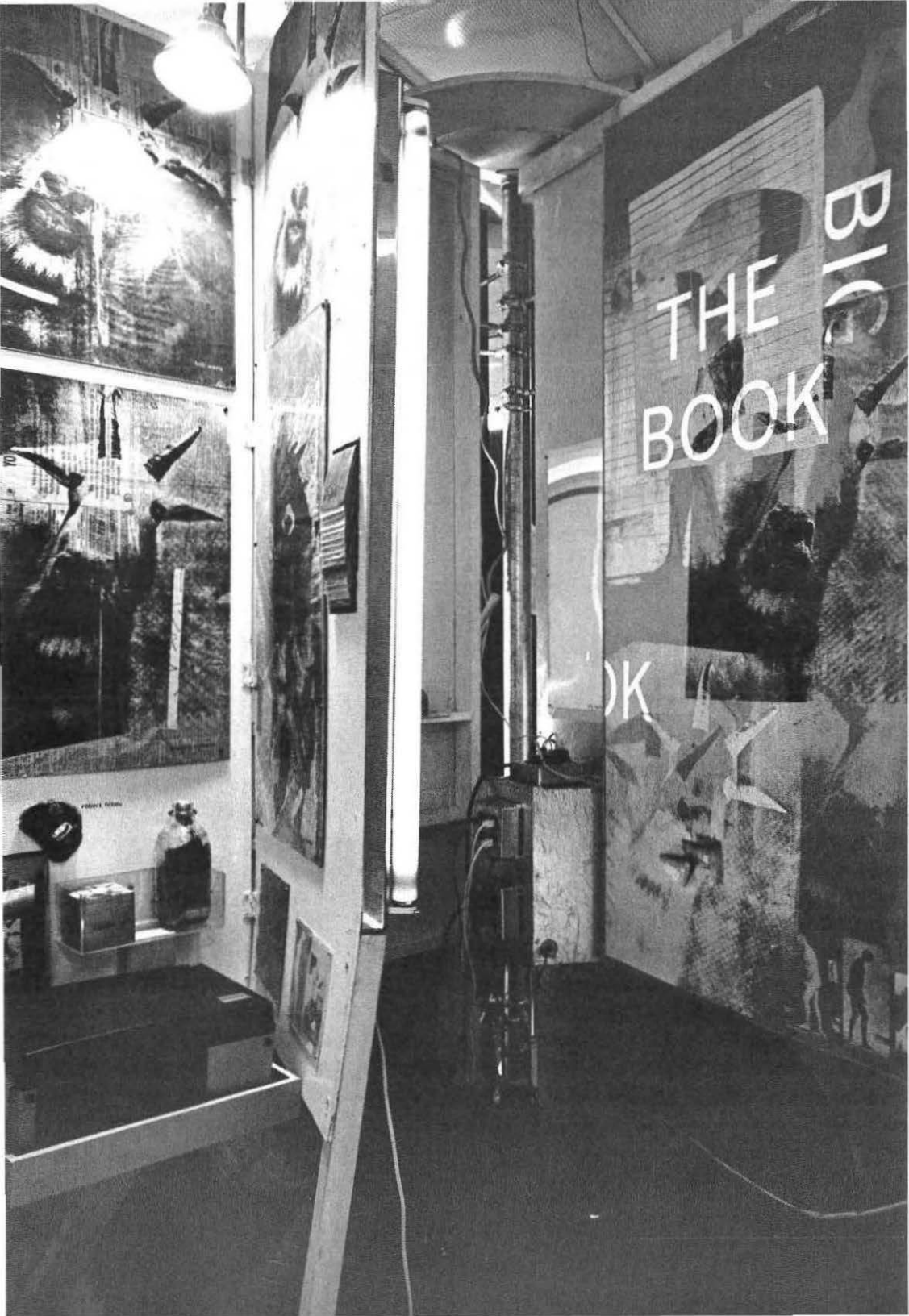
On one level, *Words* is light-hearted, jazzy, flip. Within this mood, there are contrasts. The larger room is public, bright and more formal in both the character and also in the placement of lettered strips, cloth-rolls, and red and white blinking lights. The small room is more subdued, private, organic, and less "arranged." On another, less obvious, level, the composition of the environment is intended to confer upon this "pop" material a sense of a Special Place. The rooms within a normal room, their centrality and squareness (9'x9' and 6'x6'), the repeated words and phrases, the passage in gradual degrees from an outer world into an inner one, may suggest to the sensitive participant a sanctuary or tabernacle of sorts, an enshrinement of The Word. In this presence, our acts become ritual and our everyday is transformed.

Allan Kaprow (reprinted from the Smolin Gallery catalog)

Figure 5. *The Big Book,* 1964-1967, by Alison Knowles. Courtesy of the artist.

The Big Book is not a product, but a process, and the person using the *Book* must accept himself as part of the process, discarding enough reserve to bend over and enter the *Book*—flexing, flowing, discarding stances. *The Big Book* cannot be known without being entered, and it cannot be entered without being modified—so that getting to know it alters it, even as it alters us, and there can be no one interpretation.

So down on hands and knees then, and through the cover, on through a hole burned in page of vinyl artifice, and down onto belly to crawl through a tunnel in a wall of artificial grass and water, imitating a descent, but actually remaining on floor level. After wiggling through the tunnel, one enters the apartment, an image of unpretentious Manhattan loft living in the 1950's and early 1960's. This apparent underworld, such as an epic hero usually enters, presents the processes of life nonchalantly, without varnish. Everything is useful here; there are aspirin, books, cans of soup, and other ordinary household objects. The telephone works, the stove will heat water for tea. The acceptance of this mundane, workaday underworld has the effect of elevating it, and while one enters through a tunnel, one exits through a window, and is free to examine the gallery of goats on page 4, or to climb a short ladder which moves on casters, simulating an experience of attaining precarious heights. Of course *The Big Book* can be read backwards or sideways, and anyone else who takes this journey will read it differently. But from any angle, to be in *The Big Book* is necessarily to be as mobile, kinetic, audial, visual, energetic, and beautiful, as it is.—William S. Wilson, New York.


THE BOOK

give structure to spectator participation he developed his "action collages," which extend Pollock's gestural approach and total field painting and are governed by Cage's ideas about chance and indeterminacy. The Happening, as it became known, has the makings of a new form of theater. It combines environment and action into compartments of varying size and duration; there is no single focus and no separation between actors and audience.

Alison Knowles, author of the *Big Book*, aligns herself more with Cage than with Kaprow. Four years of creativity, as a writer, silkscreen camera technician, housewife, performer and friend to the inner circle of the Something Else Press, have been crammed into a unique three-dimensional assemblage. Radiating from a central axis, the door-size pages create compartments which function, literally, as rooms of a house, metaphorically as "stills" of an everyday existence, and metaphysically as nooks and crannies of the mind. "Reading" the *Big Book* takes as much time and willingness to become involved as it does engaging in a personal relationship. Crawling through the *Big Book* resembles a physical and spiritual tour of discovery. Unlike Kaprow's *Words,* one can walk in and out of any given page as one would consult a dictionary or sample an anthology. A sequence may be indicated but is never enforced. In a way, the *Big Book* concretizes Alison Knowles' "event pieces." It not only sets the stage for, but, through various additive devices such as light, taped sound, and a live telephone and hot plate, partakes in the action. Offering art within art, life within life, and a world within a world, the *Big Book* comes closer than any work in this exhibition to a radical dissolution of the barriers that separate art from life: it proposes life as art.

The A.Typ.I. Legibility Research Committee

The following is a summary of the discussion at the inaugural meeting (November 11, 1967) of the International Legibility Research Committee sponsored by the Association Typographique Internationale and held at UNESCO *in Paris immediately following the Association's Xth Congress. This report has been prepared by the Committee.*

Opening the meeting, Dr. Bror Zachrisson referred to the variety of possible approaches to the study of legibility. For about fifteen years it has interested ophthalmologists, teachers, and those concerned with semantics to name only the most important. It would clearly be desirable to harness the work of these various specialists. Designers and psychologists would also be interested in such work.

The problem could be divided into two areas—subjective and objective. In the objective area come texts for continuous reading, and also the legibility of the constituent elements by which they are composed (signs, symbols, and letters). In the subjective area we have the congeniality factor, depending upon familiarity and upon aesthetic pleasure in the appearance of the texts. Clearly this is over-simplification, but it will help us to define the area.

Dr. Zachrisson then asked those present to state their names and their activities. He went on to explain that the inaugural meeting was an experimental one; its outcome would depend upon many factors, not least upon the funds which might become available. He suggested the compilation of a list of psychologists working on legibility problems. The representatives from Czechoslovakia stressed the degree of interest in their country for legibility research, and asked that this subject should be a principal theme of the XIth Congress of A.Typ.I. to be held in Prague from September 16–20, 1968.

Mr. Herbert Spencer then outlined his program of research at the

Royal College of Art, London. He emphasized that the aims of all printing today may, very broadly, be said to achieve one or more of these three ends: to entertain, to persuade, or to inform. His interest was in the field of information-printing.

Miss Alison Shaw suggested that the committee should co-opt a psychologist to assist in its work.

Dr. Zachrisson reminded the meeting that if funds were to be found, the committee should work under the patronage of a university or established institution, and asked Monsieur Charles Peignot to maintain contact with UNESCO, for with the support of that body, it would be far easier to obtain funds for the work of the International Legibility Research Committee. Monsieur Peignot hoped such support might be forthcoming if contact with UNESCO were maintained.

Mr. Ernest Hoch observed that much as he respected psychologists, their work in the field of legibility had sometimes suffered because they used valid techniques, but often missed what were the real problems in the field of typography.

Dr. Merald Wrolstad assured the meeting that reports on current research would be welcomed by *The Journal of Typographical Research*. With additional assistance, extracts would also be published independently of the *Journal*.

Mr. Spencer stressed the importance of completing a survey of what had already been studied. He had already assembled a considerable amount of information, but he would welcome notification of other research now being conducted. He also wished to tackle problems of terminology, and he went on to emphasize the importance of publishing the results of research; for only in this way do we attract observations from others which serve to complete our work.

There followed some discussion between Monsieur Peignot and Dr. Zachrisson on methods of approach to the problems facing the committee. Dr. Zachrisson insisted that the correct approach was first to define the problems, then to decide which of them were worth investigation, and then to recruit the persons best qualified to conduct the researches.

On the problems of organization and finance, it was agreed that even though the Association lacked adequate staff and funds, it could still encourage and report upon informal meetings between various experts in different countries.

Mr. John Dreyfus explained that the present secretariat of A.Typ.I. would be transferred to London on April 1, 1968. Thereafter Monsieur Peignot would remain in contact with UNESCO, but there would be no permanently manned office remaining in Paris.

Mr. Dreyfus stressed the desirability of first defining the scope of the activities to be undertaken by the new committee, as he could only try to find funds for its work when its activities could be clearly stated. He would be willing to try to raise funds in the United States.

Mr. Zachrisson preferred the committee to be based in London. He would willingly play his part from his office at the Graphic Institute in Stockholm, without honorarium.

Monsieur Adrian Frutiger pointed out that the problems of legibility could be approached in two ways. The first was to compare all the existing typefaces and to choose the most legible of them. The second was to investigate what could be created in the future. Every firm which manufactures text-composition machinery must have an interest in legibility research. The requirements of typefaces which are to be scanned by machines might well differ from the requirements of typefaces to be read by the human eye, but he believed that the two should be studied together. Such work would be of interest to firms such as IBM or Siemens.

Monsieur Frutiger produced a chart which he had prepared to show the comparative utilization of typefaces with different characteristics, and proposed that the scientific preparation of such a chart could be of real value. He was a realist and wished to see concrete results with a practical application. Each individual type designer was "tainted" by his connection with a given firm, but there would be an advantage in having such a project sponsored by A.Typ.I.

Miss Shaw told of her experiences in studying problems of legibility for persons with defective vision, and hoped that her findings might have a wider application. Monsieur René Ponot spoke of similar experiences in France with the Ministry of Education, for whom he had produced a special alphabet to be read by persons with faulty vision.

Monsieur Roman Tomaszewski spoke of his researches in Poland, which were concentrated upon bookwork, and the problems arising from a multiplicity of different formats.

Mr. David Kindersley spoke of his special interest in regulating the space between individual letters in order to improve their formation into

easily recognizable word shapes. He had created an electronic device to achieve perfectly regular spacing between letters.

Mr. Matthew Carter spoke of his work as a type designer for Mergenthaler Linotype in Brooklyn. He regretted the fact that none of the published works on legibility were of any help to him in his work. He stressed the fact that as a supplier of typefaces, his company left a critical part of the task of creating a legible text to the typographer who settled so many details of layout. Nevertheless his company, concerned as it was with future developments, would give every assistance to those who proposed to conduct research into legibility.

Herr Herman Zapf expressed his special interest in how new machines would serve for book production. But he had also made a study of the comparative legibility of signs in the USA and in Europe, and could demonstrate certain letter combinations which came out badly. He would be happy to communicate the details to members of the committee.

Monsieur François Richaudeau explained that he was a publisher, and that for five years he had conducted some research into legibility on behalf of his customers—his readers. His field of research comprised persons aged between 30 and 60, of fairly high intelligence, related to the type of books which he published. Type sizes investigated were from 5- to 14-point. He had used a simple instrument which linked a timing device with a high speed cine-camera fitted with a special lens, and also tachyscopes. He also referred to information theory and its place in legibility research.

Monsieur Fernand Baudin put in a word to stress the importance of studying format as well as type design. Monsieur Marcel Hignette considered this an important point too, and he also dwelt on the importance of measuring comprehension, and not merely legibility.

Dr. Zachrisson observed that comprehension had indeed now become the key word, and that no serious researcher would today even consider directing his attention solely upon legibility, but would take into account all the factors which enter into the problem.

He thanked those present for their support and would welcome suggestions sent to him at the Grafiska Instituet, Valhallavagen 191, S-115 27 Stockholm, Sweden. The hope was also expressed that UNESCO would give some assistance in publishing the results of the Xth Congress and of the inaugural international committee on legibility research.

Constitution. I.C.L.R. is a committee formed by the A.Typ.I. sponsored by UNESCO. It is to be considered as a special working A.Typ.I. committee.

Goal. The goal of the committee is to trace, assemble, and disseminate information about current and projected research in the field of legibility, congeniality, and aesthetics—within the field of visual presentation. The goal of the committee also is to form common bases for legibility studies, and to explore means and ways for launching such studies.

Organization. The committee consists of a maximum of 30 co-opted members. The members are either psychologists familiar with or engaged in legibility studies, or typographic experts.

A chairman is elected at each meeting, which is expected to be held at the time of the general annual meeting of A.Typ.I. A secretary, whose function is to prepare a summary of the discussion and the decisions of the committee, is elected at each meeting. (Monsieur François Richaudeau kindly consented to act as secretary of the inaugural meeting, and the committee is grateful to him for the invaluable help which he gave in preparing and recording the inaugural meeting.)

The chairman takes the responsibility of maintaining the regular run of information, distribution, and assembly of information, etc. (At the present time, the headquarters of the committee are located at the Grafiska Institutet, Valhallavagen 191, S-115 27 Stockholm, Sweden.)

Finances. (1) In the first stages of the committee's work only minor expenses will occur. The printing and distribution of circulars, with requests for research information, seem to be the only initial causes of expenditure.

(2) Later it will be necessary to reckon with travelling expenses, etc., for experts, as well as sums for specific investigations. These financial problems will have to be solved by negotiations with A.Typ.I. and perhaps through A.Typ.I. with UNESCO.

Information. (1) The committee has gratefully accepted the offer from *The Journal of Typographic Research* to act as its main channel of

information. Queries will also be sent direct to universities, together with requests for suggestions, etc. What the committee may be able to achieve (with the help of the *Journal*) is to emphasize, by its very existence, the importance of its goals. It is also in a position to act as referee, and it should furthermore be able to act faster in the scientific field than a quarterly publication.

(2) One of the committee's most important activities will be the exchange of experiences, viewpoints, problems, and questions that the members wish to raise. This possibility alone, of expert communication, would be reason enough to form the committee.

Bror Zachrisson, President
April 1968

M. Fernand Baudin, 64 rue du Village, Bonlez par Grez-Doiceau, Belgium
Mr. Matthew Carter, Mergenthaler Linotype Co., 29 Ryerson Street, Brooklyn, New York 11205
M. André Conquet, 11 rue des Pommerets, Sevres, France
Dr. John Downing, Reading Research Unit, University of London, London WC1, England
Mr. John Dreyfus, 43 Fetter Lane, London EC4, England
M. Adrian Frutiger, Atelier Frutiger à la Vache Noire, 23 Villa Moderne, Arcueil (Seine), France
Mr. David Kindersley, Chesterton Tower, Chapel Street, Cambridge, England
Dr. William Latham, City of Sheffield Education Committee, Thornbridge Hall, Ashford-in-the-Water, Bakewell, Derbyshire, England
Mr. John Miles, 90 Ebury Street, London SW1, England
Prof. G. Willem Ovink, nv Lettergieterij en Machinehandel vh. N. Totterode-Nederland, Bilderdijkstraat 163, Amsterdam W1, Holland
Mr. Herbert Pinzke, 75 East Wacker Drive, Chicago, Illinois 60601
Sir James Pitman, The Initial Teaching Alphabet Foundation, 154 Southampton Row, London WC1, England
Dr. E. C. Poulton, Applied Psychology Research Unit, 15 Chaucer Road, Cambridge, England
M. François Richaudeau, 114 Champs-Elysées, Paris VIIIe, France
M. Philippe Schuwer, 10 rue du Docteur-Roux, Paris XVe, France
Miss Alison Shaw, The Library Association, 7 Ridgmount Street, London WC1, England
Mr. Herbert Spencer, Royal College of Art, Exhibition Road, London SW7, England
Dr. Erik Thomsen, Damarks Paedagogiske Institut, Emdrupvej 101, København nv, Denmark
Dr. Dirk Wendt, Psychologisches Institut, Von-Melle-Park 6, 2 Hamburg 13, Germany
Dr. Merald E. Wrolstad, The Journal of Typographic Research, c/o The Cleveland Museum of Art, Cleveland, Ohio 44106
Herrn. Hermann Zapf, 6000 Frankfurt/M 70, Gernhard Mannfeld Weg 24, Germany
Fil. Dr. Bror Zachrisson (*Chairman*), Grafiska Institutet, Valhallavägen 191, Stockholm, Sweden

A.TYP.I. XIth CONGRESS

The XIth Congress of A.Typ.I. (Association Typographique Internationale) will be held in Prague, Czechoslovakia, from September 16–20, 1968. A distinguished team of speakers will address themselves to the theme, Typographic Opportunities in the Computer Age. There will also be open discussions by the Congress at all of the sessions. Simultaneous translation will be provided in Czech, English, French, German and Russian.

Topics to be presented at the Congress include:
Computers in the service of printing
Categories of printed matter in the computer age
New styles of typographical layout in the computer age
Legibility: the physiological and psychological background
Methods of research into legibility and intelligibility
By what criteria are we to judge legibility ?
Of what value is tradition in type design?
Type design for the computer age
The future role of the printed word in audiovisual education

For further details write to the Secretary, A.Typ.I., 43 Fetter Lane, London, E.C.4, England.

ICOGRADA 1968 CONGRESS

The 1968 General Assembly and International Congress of the International Council of Graphic Design Associations (Icograda) will be held in Eindhoven, a town in the south of the Netherlands near the Belgian border. This Third Icograda Congress has been organized by the member associations in Belgium and the Netherlands. The Congress will be held from August 18–24, 1968, in the Great Auditorium of the Technical University in Eindhoven.

The theme of the Congress is Design Destinations—graphic design for communication in a changing world. The program chairman is F.H.K. Henrion of Great Britain.

For further information and Congress registration forms please contact the Secretary of the Congress Organization Committee: Will van Sambeek GKf, Joop van Weezelstraat 8^{IV}, Amsterdam 16, Netherlands. Telephone 110437.

Commentary: Psychological Research into Legibility

Jeremy J. Foster

In a recent paper in *The Journal of Typographic Research* (Vol. I, No. 4) Fernand Baudin made some comments on psychological research into legibility. Further consideration of these seems warranted since they serve to indicate what I take to be one of the main purposes of the *Journal,* namely to allow researchers and designers to exchange views and opinions.

First, I think we need to standardize the terminology in this field. Three terms have current usage among research workers, these being *legibility, visibility,* and *readability.* All are used to signify certain qualities of printed matter, but are used with different meanings in different contexts, sometimes by the same author. *Readability* is most often used in the sense of "comprehensibility due to the style of writing," as in the expression "readability formula." It would avoid confusion if the term were restricted to this meaning. *Visibility* and *legibility* need to be distinguished from one another. In his article M. Baudin refers to the "instant legibility of any road sign." When he later considers the influence of the total format of a printed page on the ability of the reader to understand the text, he has no single term to signify this aspect of the reading situation. In part this arises through his misapplication of the term "legibility." It is necessary to distinguish between the identifiability of a printed character or form and the ease with which running text matter can be understood under normal reading conditions. Might I suggest that for the former we should reserve the term *visibility,* while the latter should be termed *legibility.* Thus, if we measure, say, the maximum distance at which letters of a particular font can be identified, we are assessing *visibility.* If, on the other hand, we measure the ability of subjects to read connected texts printed in

contrasted styles or set out in different formats, we are examining *legibility*. I would agree with M. Baudin that these two concepts are not the same; it is unfortunate that only recently have research workers bothered to make the distinction explicit (for example: Zachrisson, 1965). The reality of the distinction is emphasized by the different results obtained in studies of particular typographic factors according to whether the method used assesses visibility or legibility. (The fact that different means of assessing visibility in turn give different results is a point which need not be elaborated here.)

The second point I should like to make is that M. Baudin apparently fails to appreciate the scope of legibility research. He states that after three-quarters of a century, research has come to the conclusion that "there is no significant difference in the relative legibility of any set of printing types designed to fulfill an identical function and compared under the same conditions of light, distance, etc." If we take legibility in the sense defined above, this conclusion is generally true, although recent studies by Poulton (1959, 1965) suggest that with more sensitive experimental techniques, reliable differences between the legibility of different typefaces may be found. But, more importantly, M. Baudin's assertion seems to imply that research has concentrated exclusively on typefaces. This is, of course, not the case. Numerous studies of other typographic variables such as type size, line length, etc., have been published. Furthermore, there have been a number of experimental investigations in which the format of the page and its effects on legibility have been examined. For example, there are the Dearborn, Johnston, and Carmichael studies (1949, 1951) on the "peak-stress" system, the Herschberger and Terry (1965) work on typographic cuing, and the various studies on novel layouts (Coleman and Hahn, 1966; Coleman and Kim, 1961; Klare, Nichols, and Shuford, 1957; North and Jenkins, 1951). While I would be the last to maintain that all the questions are answered (indeed, only a start has as yet been made in considering the wider aspects of typographic design), it is less than generous to imply that researchers have not been aware of these problems.

M. Baudin points out that the ability to write in an orderly and logical fashion is something which has been neglected in the curricula of our higher learning establishments but which influences the ease with which text can be understood. Again, I agree with him, but this topic has also been the subject of some research-interest: readability is concerned

with just this problem, and perceptual psychologists have also emphasized the importance of orderly writing for ease of reading (for example: Cheetham, Poulton, and Grimbly, 1965; Vernon, 1956). Some attempts have also been made to consider the extent to which the total layout of a printed passage varies in terms of its appropriateness to the meaning of the text (Zachrisson, 1965), although there seems as yet to have been no examination of whether appropriateness (also termed congeniality) influences intelligibility, this being a rather surprising omission.

There are signs that typographers and research workers are beginning to appreciate that optimal typographic design involves consideration of the total text-reader-environment complex. We might hope that in the future legibility research will be related to the particular reader and the particular kind of text and perhaps also to the reading environment.

Finally, might I suggest that for these and similar problems to be clarified, it is necessary for designers and research-workers to exchange views, opinions, and findings. One of the most important and commendable aspects of *The Journal of Typographic Research* is that it provides a forum in which such exchanges can take place.

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Vernon, M. D. The improvement of reading. *Brit. J. educ. Psychol.*, 1956, *26*, 85–93.
Zachrisson, B. *Studies in the Legibility of Printed Text*. Stockholm: Almqvist and Wiksell, 1965.

Jeremy J. Foster is a member of the psychology faculty at the University of Newcastle-upon-Tyne, England. A graduate in psychology from Manchester University, he spent two years as research fellow in the School of Advanced Studies of Manchester College of Art and Design carrying out a program of research into the legibility of print; he is continuing his research at Newcastle.

Book Review

1. Coppersmith, Stanley (ed.). *Frontiers of Psychological Research: Readings from Scientific American.* San Francisco: Freeman and Co., 1966. 322 pages. $10.00 ($4.95 in paper).
2. Gregory, R. L. *Eye and Brain: The Psychology of Seeing.* New York: McGraw-Hill, 1966. 254 pages. $2.45 (paper).
3. Vernon, M. D. (ed.). *Experiments in Visual Perception: Selected Readings.* Baltimore: Penguin Books, 1966. 443 pages. $1.95 (paper).

Frontiers of Psychological Research is, in the words of the editor, "an attempt to provide research reports covering the major areas of psychology" and also, to "serve as an introduction for the scientist or informed layman who wishes to learn more about the nature of contemporary psychology." The editor, Stanley Coppersmith of the Department of Psychology, University of California at Davis, has selected 44 articles from over a hundred that have been published on psychological topics in the *Scientific American* during the past 18 years. These have been organized into five "parts" and three of these into "subdivisions." The editor has contributed a helpful introduction to each of these eight sections as well as a general introduction with "travel tips" intended to guide readers who cross the frontier into the domain of psychology.

The names of these parts and subdivisions with the number of articles each comprises are:

I. The Evolutionary Perspective: Animal Behavior and Cross-species Comparisons (four)
II. Biological Determinants of Behavior
  A. Heredity and Maturation (three)
  B. Physiological Mechanisms (four)
III. Environmental Determinants of Behavior
  A. Sensory and Social Stimulation (seven)
  B. Interaction with the Environment: Learning, Memory, Problem-solving (seven)

IV. Cognitive and Unconscious Determinants of Behavior
   A. Cognitive Determinants (seven)
   B. Unconscious Determinants (seven)
V. Applications of Psychological Knowledge and Techniques (five)

Eye and Brain covers more than its subtitle, The Psychology of Seeing, implies since there are chapters describing the physics of light, the evolution of visual receptors, the anatomy and the physiology of the human eye, as well as the brain in general and the visual cortex. The rest of the 13 chapters are more directly focused on psychological problems—seeing, brightness, movement, color, and illusions. Other chapters take up art and reality, learning to see, seeing and believing, and visual problems of space travel. The author, R. L. Gregory, is in charge of the perception laboratory in the Department of Psychology, Cambridge University, England; he has published many technical articles describing his work in perception and has invented a number of optical instruments.

Experiments in Visual Perception comprises 39 papers selected and, in some cases, abridged by the editor, M. D. Vernon, Professor of Psychology at Reading University, England. They are devoted to experimental studies since the editor feels that theoretical matters can be pursued best in books, although in the introduction, he modestly refrains from suggesting three books that he has written on perception. He was also guided in his selections by historical considerations so that the readings "have the additional function of demonstrating to the student the gradual evolution of psychological experiment." The areas covered and the number of selections in each area are:

I. Perception of Form (five)
II. Perception of Space and Distance (six)
III. Perception of Constancy (five)
IV. Perception of Movement, Apparent Movement, and Casuality (seven)
V. Effect on Perception of Motivation and Personality (seven)
VI. Piaget's Observations on the Development of Perception in Infancy (four)

Each area is introduced by a very brief statement indicating the nature of the articles in it.

These three books might well be read as a unit since they are complementary and supplementary at the same time. The first covers psychology in general, the second the psychology of vision, and the third specific research in visual perception. As collections, the first and the last have the advantage that they can be picked up and read one article at a

time. In the second, the browser can, of course, find interesting sections that can stand by themselves, but it should be read all the way through to appreciate the author's views. Although the first two can easily be understood by the "informed layman," many of the articles in *Experiments in Visual Perception* will be comprehensible only to those with some background in psychology or a related science and some knowledge of statistics.

Frontiers of Psychological Research can be recommended on the basis of quality of the articles and the adequacy of the editor's introduction for anyone wanting a fast survey or a quick and highlighted trip through the field of contemporary psychology. Those who are interested specifically in sensation and perception, however, might want to purchase separate offprints (available from W. H. Freeman and Co. at only $.20 each) of the seven pertinent articles in Coopersmith's collection. These articles are: Kalmus, "Inherited sense defects"; Fantz, "The origin of form perception"; Reisen, "Arrested vision"; Ittelson, "Experiments in perception"; Wallach, "The perception of motion"; Witkin, "The perception of the upright"; and Chapanis, "Psychology and the instrument panel." It might be pointed out that the paperbound edition of the readings is a real bargain at $4.95, since you get $8.80 worth of offprints plus the editor's remarks. Whether the clothbound edition is worth the additional $5.05 is debatable, since it is not as convenient to carry and cannot easily be ripped apart for use as separate articles or for reorganization of the component offprints. Although I have not seen the paperbound, the dust-jacket and the cover of the clothbound are done with a harsh blue-green that I find unpleasant.

The color on the cover and in the illustrations of Gregory's *Eye and Brain,* on the other hand, is quite good and the diagrams and the photographs are clear. Unfortunately, the paper is not opaque enough to prevent bleeding through. This is merely disconcerting in the text but is fatal in some of the diagrams exemplifying visual illusions. Many of the diagrams are awkwardly placed on the page or in relation to explanatory text; for example, the random patterns of Julezs' experiment are reproduced in large scale and put on opposite pages so that it is impossible to fuse them with unaided eyes and the whole point is lost. This book is highly recommended for its content, though, and is an excellent introduction to visual perception. Gregory's prose is in the sparse and lucid style of the English who seem to learn how to write clearly (among other things) during their school years. He manages to work in a good deal of history and other background material in a painless manner and gives interesting examples of research in perceptual areas. In addition, he sets forth his own general theory of illusions so that even those who are relatively familiar with perceptual

phenomena will find this of interest and an important contribution to perceptual theory.

Experiments in Visual Perception will be useful to those having enough scientific background to handle the technical matters discussed in the reports and, in terms of price and the amount of material included, is also a bargain. It might be pointed out that excerpts from Julesz' paper, "Binocular depth perception without familiarity cues," are accompanied by figures in small scale and on one page so that it is possible to fuse the images and appreciate the phenomena discussed.

George S. Welsh

George S. Welsh is professor of psychology at the University of North Carolina (Chapel Hill, N.C. 27514). In addition to extensive research and publication in personality, Dr. Welsh's current interests include creativity and visual aesthetics.

Books Received

Inclusion of a publication on this list does not preclude its review in the Journal. As space permits, reviews will be printed of those publications which make special contributions to typographic/letterform research and education.

Anderson, Arne, and Ib K. Olsen. *Scandinavian Advertising Art.* New York: Frederick A. Praeger, 1967. 120 pages. $20.00

Atchley, Dana. *ABC Design.* New York: Wittenborn & Co., 1965. 28 pages. $9.00

Barnett, Michael P. *Computer Typesetting: Experiments and Prospects.* Cambridge: M.I.T. Press, 1965. 245 pages. $10.00

Biegeleisen, J. I. *Art Directors' Work Book of Type Faces.* New York: Arco Publishing Co., 1965. 212 pages.

Bloy, C. H., *A History of Printing Ink: Balls and Rollers—1440-1850.* London: Wynkyn de Worde Society, 1967. xii + 148 pages. 2/5/-

Borko, Harold, ed., *Automated Language Processing: the State of the Art.* New York: John Wiley & Sons, 1967. xiv + 386 pages. $12.95

Caflisch, Max. *Kleines Spiel mit Ornamenten.* Bern: Angelus-Druck, 1965. 88 pages. FR./DM28.-

Cataldo, John W. *Graphic Design and Visual Communication.* Scranton, Pa.: International Textbook Company, 1968. xiv + 295 pages. $15.00

Catich, E.M. *A Development and Lineage Theory for the Roman Alphabet.* Cohoes, N.Y.: Mohawk Paper Mills, 1967. Chart and essay, paper. Free distribution.

Character Recognition: 1967. London: British Computer Society, 1967. vi + 195 pages (paper).

Cherry, Colin. *On Human Communication: A Review, a Survey, and a Criticism.* Cambridge: M.I.T. Press, 1966 (2nd ed.). 337 pages. $10.00

Chevreul, M. E. *The Principles of Harmony and Contrast of Colors.* New York: Reinhold Publishing Corporation, 1967. 256 pages. $27.50

Clair, Colin. *A History of Printing in Britain.* New York: Oxford University Press, 1966. 314 pages. $10.00

Colby, Jean Poindexter. *Writing, Illustrating and Editing Children's Books.* New York: Hastings House, 1967. 318 pages. $6.95

Copeland, L'Harl. *Design of the Roman Letters.* New York: Philosophical Library, 1966. ix + 66 pages. $3.75

Dair, Carl. *A Typographic Quest* (five booklets on typography). New York: West Virginia Pulp and Paper Company, 1965-1967. Free distribution.

Day, Kenneth, ed. *Book Typography 1815-1965 in Europe and The United States of America.* Chicago: University of Chicago Press, 1967. 401 pages. $17.50

Degering, Hermann. *Lettering: Modes of Writing in Western Europe from Antiquity to the End of the Eighteenth Century.* New York: Universe Books, 1965. 240 pages of illustrations; 40 pages of text. $15.00

Deuel, Leo. *Testaments of Time: The Search for Lost Manuscripts and Records.* New York: Alfred A. Knopf, 1965. 643 pages. $8.95

Downing, John. *The i.t.a. Symposium: Research Report on the British Experiment with i.t.a.* London: National Foundation for Educational Research, 1967. xviii + 168 pages.

Gourdie, Tom. *A Guide to Better Handwriting.* New York: Viking Press, 1967. 96 pages. $1.95

Gregory, Albert. *Overlap.* New York: Wittenborn, Inc., 1967. 89 pages.

Helm, June, ed. *Essays on the Verbal and Visual Arts: Proceedings of the 1966 Annual Spring Meeting, American Ethnological Society.* Seattle: University of Washington Press, 1967. 224 pages. $4.00 (paper)

Hirsch, S. Carl. *Printing from a Stone: The Story of Lithography.* New York: The Viking Press, 1967. 111 pages. $3.75

Hutchings, R. S. *A Manual of Script Typefaces.* New York: Hastings House, 1965. 92 pages. $6.95

Hutchings, R. S. *A Manual of Decorated Typefaces.* New York: Hastings House, 1965. 96 pages. $6.95

Hutchings, R. S. *The Western Heritage of Type Design.* New York: Hastings House, 1963. 127 pages. $7.95

Information, A Scientific American Book. San Francisco: W. H. Freeman and Co. 218 pages. $5.00 (cloth), $2.50 (paper)

Ionesco, Eugène. *Délire a Deux: Essai de Calligraphie Sonore par Massin d'Après l'Interprétation de Tsilla Chelton et de Jean-Louis Barraulta l'Odéon-Théatre de France Version Scénique.* Paris: Gallimard, 1966. 72 pages.

Kepes, Gyorgy, ed. *Sign, Image, Symbol.* New York: George Braziller, Inc., 1966. 282 pages. $12.50

Kiell, Norman, ed. and compiler. *Psychiatry and Psychology in the Visual Arts.* Madison: University of Wisconsin Press, 1965. 250 pages. $5.00

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Lee, Marshall. *Bookmaking: the Illustrated Guide to Design & Production.* New York: R. R. Bowker Company, 1966. 416 pages. $12.75

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Lewanski, Richard C. (compiled by). *European Library Directory.* Florence: Leo S. Olschki, 1968. 774 pages.

Lindegren, Eric. *ABC of Lettering and Printing Types.* New York: Museum Books. *Volume A:* Lettering and type design—collection of the work of renowned graphic designers, 1964, 155 pages, $12.50. *Volume B:* Outstanding typefaces used today in the printing of books and advertising typography, 1965, 335 pages, $15.00. *Volume C:* A survey in words and picture of the development of lettering and the history of printing, 1966, 135 pages, $15.00

Matrix: An Experiment in Visual Communication. Rochester, N.Y.: Office of Educational Research, Rochester Institute of Technology, Tabloid periodical. Free distribution.

McLuhan, Marshall. *The Gutenberg Galaxy: The Making of Typographic Man.* Toronto: University of Toronto Press, 1962. 294 pages. $2.25 (paper)

McLuhan, Marshall, and Quentin Fiore. *The Medium is the Massage: An Inventory of Effects.* New York: Random House, 1967. 160 pages. $10.95

McLuhan, Marshall, et al. *Verbi-Voco-Visual Explorations.* New York: Something Else Press, 1967. 62 pages. $6.95 (cloth), $2.95 (paper)

Melcher, Daniel, and Nancy Larrick. *Printing and Promotion Handbook* (3rd ed.). New York: McGraw-Hill Book Company, 1966. 451 pages. $15.00

Miller, George A. *The Psychology of Communication: Seven Essays,* New York: Basic Books, Inc., 1967. x + 198 pages. $4.95

Moranti, Luigi. *L'Arte Tipografica in Urbino (1493-1800)*. Florence: Leo S. Olschki, 1967. 370 pages.

Morris, Charles. *Signification and Significance: A Study of the Relations of Signs and Values*. Cambridge: M.I.T. Press, 1964. x + 99 pages. $5.95

Mueller, Fridolin (ed.) *Hendrik Nicolaas Werkman*. New York: Hastings House, 1967. 104 pages. $10.00

Mueller, Robert E. *The Science of Art: The Cybernetics of Creative Communication*. New York: John Day Company, 1967. 352 pages. $6.95

Müller, Fridolin, ed. *Piet Zwart*. (introduction by Peter F. Althaus; text in English, French, and German). New York: Hastings House, 1966. 112 pages.

Neumann, Eckhard. *Functional Graphic Design in the 20's*. New York: Reinhold Publishing Corporation, 1967. 96 pages. $6.95

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Richaudeau, François. *La Lettre et l'Esprit*. Paris: Editions Planète, 1965. 102 pages. 15,45F (paper)

Roberts, Raymond. *Typographic Design*. London: Ernest Benn Limited, 1967. 198 pages. $7.50

Salman, Robert. *Fleurons et Vignettes*. Paris: Compagnie Française D'Editions, 1966. 64 double-pages. 100F

Scheidig, Walter. *Weimar Crafts of the Bauhaus 1919-1924: An Early Experiment in Industrial Design*. New York: Reinhold Publishing Corp., 1967. 150 pages. $16.50

Schuwer, Philippe. *History of Advertising*. London: Leisure Arts Limited, 1967. 112 pages. 32/-

Science Citation Index: 1966 (July to September), An International Interdisciplinary Index to the Literature of Science and Technology. Philadelphia: Institute for Scientific Information, 1966. 3 volumes.

Seddon, John. *The Penman's Paradise*. Stuttgart-Bad Cannstatt: Dr. Cantz'sche Druckerei, 1966.

Skinner, B. F. (developed by). *Handwriting with Write and See*. Chicago: Lyons & Carnahan, 1968. Paper-bound workbooks and teacher's manuals.

Spencer, Herbert, ed. *The Penrose Annual 1967*. London: Percy Lund, Humphries & Co., 1967. 306 pages. $16.50

Stearn, Gerald E., ed., *McLuhan: Hot & Cool—a Primer for the Understanding of a Critical Symposium with a Rebuttal by McLuhan.* New York: The Dial Press, 1967. xxii + 312 pages. $6.95

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Typomundus 20: A Project of the International Center for the Typographic Arts. New York: Reinhold Publishing Corp., 1966.

USA Standard Character Set for Optical Character Recognition. New York: United States of America Standards Institute, 1967. 44 pages. $5.00 (paper)

Vianello, Nereo. *La Tipografia di Alvisopoli e Gli Annali delle Sue Pubblicazioni.* Florence: Leo S. Olschki, 1967. 251 pages. 6,000 lire

Williams, Emmett. *An Anthology of Concrete Poetry,* New York: Something Else Press, 1967 x + 342 pages. $10.00 (cloth), $3.00 (paper)

Williamson, Hugh. *Methods of Book Design: The Practice of an Industrial Craft.* London: Oxford University Press, 1966 (2nd edition). 433 pages. $10.10

Wilson, Adrian. *The Design of Books.* New York: Reinhold Book Division, 1968. 160 pages. $15.00

Wilson, Robert A. *Optical Page Reading Devices.* New York: Reinhold Publishing Corp., 1966. 197 pages. $10.00

Books for Review

Publishers should send books and other materials for review in the *Journal of Typographic Research* to either of two addresses:

Europe—M. Fernand Baudin, c/o *Journal of Typographic Research,* 64 rue du Village, Bonlez par Grez-Doiceau, Belgium.

All other publishers—Editor, *Journal of Typographic Research,* c/o The Cleveland Museum of Art, Cleveland, Ohio, USA 44106.

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.

Dear Mr. Huss:

I was extremely interested in your piece, "A Chronological List of Typesetting Machines and Ancillary Equipment, 1822–1925," in No. 3 of *The Journal of Typographic Research.*

I see you give the date 1898 for Friese-Greene (No. 107); there were detailed references to the invention in the trade press here in 1896. An account in the monthly *Printers' Register* (August 6, 1896) describes a keyboard-operated photosetter in what sounds like extremely modern terms. It spoke of "strips of opaque material" each with a fount of letters "the size of which may be enlarged or reduced by altering the focus," and of how by keyboard operation the strips moved to the required letter until a line was completed when a camera photographed them "on to a roll of film which moves forward just the depth of a line after the exposure." The *Register* went on to quote the daily press as reporting that George Newnes, a big periodical publisher of those days, was having experiments made with the Friese-Greene machine; presumably these came to nothing.

On the P. P. Knyagininsky tape-operated Automatic Composer (the Russian word was actually the one for "Compositor"), perhaps you know the detailed technical account (in Russian) in G. A. Vinogradov, *Composing Machines of Russian Inventors* (Moscow: 1949). This book also gives details of the "Rapid Printer" of Michael I. Alisov (a kind of justifying typewriter) which was shown at Philadelphia by the inventor in 1875–76, and of the "Stereograph" of Joseph N. Livchak (invented around 1872, patented in Russia 1878–1882) which appears to have been much the same as Mergenthaler's band machine of 1884.

The Russians credit V. A. Gassiev (who was still living in 1950) with inventing, in 1896, the first photosetter. I know no details of this, but I gather they are treated in another book (in Russian) by N. D. Kanukov, *V. A. Gassiev—Maker of the First Photo-setting Machine* (Moscow: 1954).

G. Allen Hutt, 8 Regents Park Terrace, London, N.W.1, England

Note: Readers are urged to send to the *Journal* any corrections or additions to Mr. Huss' list for a future published addendum.

Résumé des Articles

Traduction: Fernand Baudin

Une méthode pour mesurer le degré d'organisation typographique *par Gui Bonsiepe*

Il s'agit de comparer et de mesurer exactement le degré d'ordonnance de deux mises en page. On distingue deux ordres de mises en page: l'un, systématique; l'autre, organique. Pour mesurer le degré d'ordre (en l'occurence de complexité) de deux mises en page -une première version et une version modifiée- on fit appel à la formule de Shannon. Ce qui démontre qu'une évidence visuelle est vérifiable par un jugement mathématique empirique. D'ou quelques conséquences logiques furent tirées tendant à fonder une esthétique sur la théorie de l'information. Une heuristique de la mise en page est esquissée. Les limites et les possibilitiés d'une algèbre des problèmes typographiques sont examinées.

"Ecriture" et "alphabet" *par John Mountford*

En anglais, les mots "écriture" et "alphabet" sont, l'un et l'autre, relié à l'idée de langage. L'idée de langage est incluse dans "écriture" comme l'idée d'écriture est incluse dans "alphabet". D'autres disciplines qui se servent de ces mêmes mots dans un sens technique, les entendent cependant dans un sens différent; l'usage commun, lui, est souvent vague. En tant que science du langage, la linguistique peut faire des distinctions utiles entre ces différents sens. C'est ce qui est tenté par John Mountford, avec la convection que des "voisins" ne devraient pas être "séparés par des terminologies identiques".

La Normalisation des Graphemes Alphabétiques *par S. B. Telingater*

Pendant le développement historique de nos alphabets nationals, le rapport entre le son du langage et ses symbols visuels est devenu obscur. Le besoin d'un plus fort rapport direct entre le son et le symbol est diseuté; une recombinaison des graphemes dans nos alphabets est suggérée et illustrée. [trans.: L.S.]

Typographie Anamorphose *par Jan Slothouber et William Graatsma*

Anamorphose, ou forme restituée, désigne un phénomène optique par lequel une image déformée retrouve une apparence normale. Un exemple d'anamorphose de lettre récemment réalisée en Hollande est reproduit et commenté.

Comment mesurer la valeur d'un système électronique de "coupures"? *par Dwight D. Brown*

A l'heure actuelle il n'existe encore aucun moyen de vérifier le degré de précision de telle ou telle programmation électronique des "coupures". L'auteur démontre la nécessité d'un tel controle, et l'examine notamment sous l'angle : de la fréquence des mots et des coupures, de l'interlettrage et de la

"chasse". La précision des coupures dans un programme donné dépend de la mesure dans laquelle il peut choisir les mots à couper sans être privé de faire les coupures possibles. L'auteur propose plusieurs formules susceptibles de garantir un maximum de précision dans différents contextes et permettant d'interpréter en termes de "positif" ou "négatif" les mauvaises coupures éventuelles.

Des images à lire; des poèmes à regarder *par Jan van der Marck*
Les arts visuels contemporains tendent de plus en plus à confondre langage et représentation visuelle. Cette tendance vers un langage visuel—poétique plutot que communicationnel—trahit l'effondrement de toute tradition dans tous les arts. C'est à quoi les travaux de quelques artistes exposés au Mussée d'art contemporain à Chicago fournissent l'illustration aussi bien que l'occasion.

Kurzfassung der Beiträge

Übersetzung: Dirk Wendt

Eine Methode zur Messung des Ordnungsgrades in typographischen Entwürfen *von Gui Bonsiepe*
Es wird ein Verfahren beschrieben, um den Ordnungsgrad von typografisch gestalteten Seiten zu messen. Zwei Typen von Ordnungen werden unterschieden: Systemordnung und Verteilungsordnung. Um den Ordnungsgrad, d.h. in diesem Fall die Komplexität zweier Seiten—einer alten Version und einer Redesign-Version—zu quantifizieren, wird die Shannon'sche Formel herangezogen. Ein Evidenzurteil über die Ordnung eines Designs wird durch ein mathematisch-empirisches Urteil abgestützt. Mögliche Konsequenzen für die Informationsästhetik werden angedeutet. Eine Designheuristik wird skizziert, wobei auf Möglichkeiten und Grenzen einer Algorithmisierung von Designproblemen hingewiesen wird.

"Schreiben" und "Alphabet" *von John Mountford*
Die englischen Wörter für "Schreiben" und "Alphabet" sind beide mit der Sprache verbunden. Der Begriff der Sprache ist im "Schreiben" impliziert, der Begriff des Schreibens im "Alphabet". Verschiedene Fachrichtungen, die diese Wörter als technische Fachbegriffe verwenden, benutzen sie in unterschiedlicher Bedeutung; der Alltagsgebrauch ist oft ungenau. Die Linguistik als Wissenschaft von der Sprache kann dazu beitragen, diese Bedeutungen auseinander zu halten. In dieser Richtung wird ein Anfang gemacht, indem die Auffassung vertreten wird, daß miteinander verwandte Disziplinen nicht "durch eine gemeinsame Terminologie getrennt" zu sein brauchten.

Die Vereinheitlichung alphabetischer Grapheme *von S. B. Telingater*
Während der historischen Entwicklung unserer nationalen Alphabete ist die direkte Beziehung zwischen den Sprachlauten und ihren visuellen Symbolen

teilweise verloren gegangen. Die Notwendigkeit einer engeren, direkten Beziehung zwischen Laut und Schriftzeichen wird besprochen und eine veränderte Anordnung der Grapheme innerhalb unseres Alphabetes wird vorgeschlagen und illustriert. [trans.: K,S.]

Anamorphosen im typographischen Entwurf *von Jan Slothouber und William Graatsma*

Eine Anamorphose ("Form-Wiederkehr") ist ein optisches Phänomen, bei dem eine verzerrte Figur als normal wahrgenommen wird. Es wird ein Beispiel von Buchstaben-Anamorphosen gezeigt und diskutiert, das kürzlich in Holland angewandt wurde.

Für eine Norm zur Messung der Genauigkeit automaten-gesteuerter Worttrennungen *von Dwight D. Brown*

Es gibt noch kein einheitliches Maß zur Messung der Genauigkeit der computer-gesteuerten Worttrennung. Der Verfasser diskutiert die Notwendigkeit einer solchen Norm und erwägt unter anderem : Worthäufigkeit, Trennungs-Wahrscheinlichkeit, Wortzwischenraum und Zeilenverlängerungs-Faktoren. Eine sehr hohe Trenngenauigkeit kann errreicht warden, wenn das Programm die Wörter wählen kann, die es trennen will, ohne daß es "bestraft" wird, wenn es Trennungen unterläßt, wo sie möglich wären. Der Verfasser gibt eine Reihe von Formeln, mit deren Hilfe man bei verschiedenen Publikationsmedien zu Trennungsgenauigkeitsschätzungen und Maßen für "positive" und "negative" Worttrennungsfehler kommen kann. (Anmerkung des Übersetzers : Das Problem der Worttrennung [am Ende einer Zeile] liegt bei der englischen Sprache anders als bei der deutschen, da dort nicht nach Silben, sondern nach Stamm und Endung des Wortes getrennt wird.)

Bilder zum Lesen/Poesie zum Anschauen *von Jan van der Marck*

Sprache und bildliche Darstellung werden in der zeitgenössischen darstellenden Kunst mehr und mehr vermischt. Diese Tendenz zu einer visuellen Sprache, die mehr der Poesie als der Nachrichtenübermittelung dient, spiegelt einen Niedergang der Tradition in allen Künsten wider. Diese Erscheinung wird diskutiert und illustriert an Beispielen aus Werken bestimmter Künstler. Diese Kunstwerke sind zu einer Ausstellung im *Museum of Contemporary Art* in Chicago zusammengestellt worden.

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John Mountford (4a, Rodney Cottages, Bristol 8, England), after studying both applied and general linguistics at the University of Edinburgh, spent three years with the Reading Research Unit of London University's Institute of Education. He has lectured and published on writing, on the linguistic aspects of i.t.a., and on the wider aspects of literacy. He describes his present preoccupation as "understanding literacy."

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Jan Slothouber and William Graatsma have since 1955 been in cooperation as architects for DSM Holland (Schinkelstraat 2, Heerlen, The Netherlands) "on the basis of agreements on dimension, form, color, and letter." Their work—mostly on cubic structure, cubic design, etc.—has appeared in special exhibits in The Netherlands and England. In 1966 they shared the Dutch Sikkensprize with Peter Struycken.

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Jan van der Marck is director of the Museum of Contemporary Art (Chicago, Illinois 60611). Born in The Netherlands, he received his Ph.D. in the history of art and archaeology from the University of Nijmegen. Following post-graduate study at the University of Utrecht and Columbia University, New York, he served as curator at the Municipal Museum, Arnheim; assistant director of the Fine Arts Department for the Seattle World's Fair; and curator at Walker Art Center, Minneapolis. Dr. van der Marck has published a number of articles and catalogs devoted to contemporary artists and art movements.