

The Journal of Typographic Research
Volume IV, Number 4, Autumn 1970

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News of Current Letterform Research

Developments in a variety of disciplines are revealing implications for letterform investigation undreamed of only a generation ago, but the Journal must be aware of specific research projects in order to report on them. Without a supporting association, the Journal must rely on reports of letterform research activity from *interested individuals*.

The Journal, therefore, encourages communication from research people, administrators, and students on individual and departmental research projects, theses, research grants, etc. Please send the Journal Editor a copy of any research report or an outline of the study—with the name and address of the people involved.

Joining the Journal Staff

Letterform research being an academic orphan, the Journal has no reservoir of talent to call upon for help in handling the myriad editorial and organizational jobs that need doing. Journal activities that involve communication with an international body of individuals and research groups can be particularly rewarding.

If you would like to join the Journal's staff, please write the Editor—mentioning, if possible, any particular area of activity you are interested in.

many “false” spelling pronunciations in English) could be obviated by optional italicization or actual underscore (sheepshead as against sheepshearer). To the users of the roman alphabet in this shrinking world, two courses seem to be open: international standardization and mutual acceptance of diacritics or a common endeavor toward their progressive elimination.

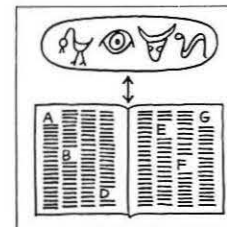
Letterforms in Photo-typography

Adrian Frutiger

The accelerated flow of information in today’s world demands that our typography be of maximum utility and comfort to the reader. There is a trend toward universal usage of fewer text faces and toward larger sizes of reader typefaces. Differentiation must be made between material designed for sustained and for reference reading. The two basic photo-composition generation systems—projective exposure and CRT generated—are compared.



Philosopher and scribe
(Pythagoras, Cathedral
of Chartres).



3000 years of writing.

I. Obligations Toward the Reader

Two thousand years ago reading and writing were the privileges of an extremely small class of people. Today the right to education belongs to the broadest masses of the world’s population. The reasons for the constantly mutating forms of our alphabet lie anchored to some degree in that perpetual drive toward the widest possible dissemination of human knowledge.

The written word has always been a binding force between two worlds: those of human ideas and of human deeds. Putting a thought into writing is obviously nothing more than a physical act, whether it is accomplished by hand with a chisel or pen, or whether in today’s technology it is accomplished by activating a composing machine. However, the actual letterform has always constituted a mirror image of the writer’s intellect. The spirit of a century, of a historical era, has never found a more explicit form of expression than in the art and technique of its style of writing or its typography.

In the dawn of history a strong hand chiseled pictorial symbols into stone—perhaps three, perhaps four during the course of an hour. Today electronic machines compose millions of letters in the same lapse of time.

Two factors may be deduced from this development:

(1) The constantly accelerating desire of man toward increased knowledge induces our technicians to invent faster means of reproduction, i.e., the composition and printing phases are accomplished at incessantly rising speeds.

(2) The universal usage of text typefaces leads to a standardization of their forms. Only a few decades ago—in every country of the occidental world—numerous, different national typefaces were in existence. Today we are experiencing a stabilization toward internationally accepted text types based on the roman alphabet and subdivided into groups like oldstyle, modern, and sans-serif, with each group containing no more than three or four well-designed typefaces used on a world-wide basis.

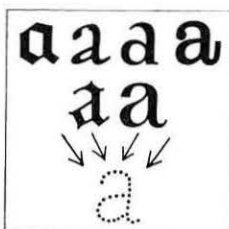
It should be emphasized that the above statements pertain to text types. Display typefaces are, in effect, experiencing a development which leads to the opposite direction: photo-display setting equipment has freed the design of letterforms from the inflexibilities of type metal and has engendered an overabundance of type and lettering styles never observed in the past.

Thus the developments go in two directions: on one hand we notice a trend toward an increasing flood of printed or written information, on the other hand a certain unification and simplification of letterforms, caused by the implications of mass production methods.

What, then, are today's requirements for text composition?

Legible typefaces

Text types have taken on utilitarian aspects. It becomes increasingly important that their structures comply with those legibility comfort requirements which must be present if a text typeface is to be acceptable to the widest possible segment of the public. As an analogy: smooth roads, soft beds, large windows, and sound-proof walls spell comfort to the average human being. The same feelings may be applied to optimum reading comfort of the printed word: suitable paper, sharp printing, well-justified



Trend toward an internationally valid character formation of the roman alphabet.

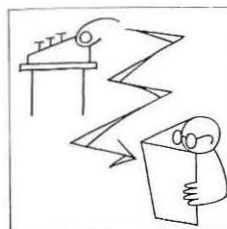


Quick and comfortable reading with a legible typeface.

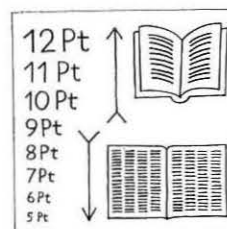
composition, and clean, open, universally recognized letterforms guarantee optimum legibility. Rapid reading has indeed become a sign of our times.

Fast, economical communication

Information is meaningful only if it reaches the recipient within a definite time limit. The path from the event itself to the reader must constantly be shortened, whether we talk about the press, about advertising, or about the book publishing field. The speed factor is frequently directly related to cost considerations. As, for example, in the case of newspapers, sales literature, time tables, technical specifications, etc., the information must be available at a reasonable price. The graphic arts techniques of our century are dependent upon constant acceleration of composition speeds.



The value of communication depends on its timeliness.



Type sizes become larger for reading, smaller for reference material.

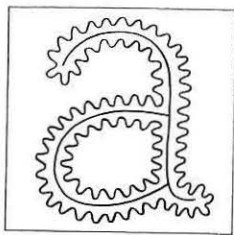
Determining type sizes

Until a few years ago text type sizes showed a noticeable trend toward a continuous drop in point sizes from decade to decade. The progress of technology made it possible to decrease the 24-point types used during the Gutenberg era to the 5- or 6-point type sizes utilized today, without seriously impairing legibility of the text. (Social and economic progress caused by the invention of electric lighting undoubtedly contributed toward this development.) On the other hand, sales statistics from the United States reveal a growing trend toward larger text type sizes in the book publishing field. Even in Europe a certain hesitancy toward the application of smaller point sizes for extensive book texts has become noticeable.

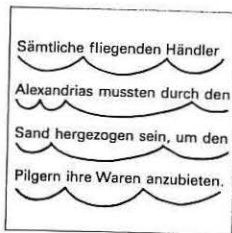
In this connection it should be noted that there exists an ever increasing necessity to divide printed material into two major categories: print to be read continuously and print to be consulted briefly. On one hand we have the immense category of information encompassing printed material which has to be read in a consecutive manner. In spite of earth-shaking prophecies in favor of the electronic audiovisual communications media, it can now safely be stated that (perhaps because of psychological and

physiological conditions inherent in the human constitution) the amount of reading material and the speed of reading will incessantly increase, so long as a precise understanding of the information is of essence. Typographers are leaning toward the usage of type sizes which enable the reader's eyes to perceive printed material for hours on end without fatigue.

On the other hand, we have the area of typography designed for reference material—trade lists, telephone books, dictionaries, manuals, etc. Reading this type of printed matter is usually confined to rather limited periods of time. Here a maximum of information has to be condensed into a minimum of space. For that reason the most ubiquitously used type sizes will be near 6-point. In the future, computer output printing will increasingly use this kind of “reference” typography. The type designer working on new letterforms within this group will have to observe the laws of automatic-optical legibility in his letter configurations.



Depth-psychological character formation.



Word shapes, not letters, are read.

Two new concepts of quality

Each letter must conform to a basic form embedded in the subconscious mind of a large mass of readers. We know, however, that the eye of the reader is more sensitive to the over-all appearance of the typographic construction than to minute detail in individual letterforms. Within a single glance or fixation point, the reader perceives word shapes, groups of words, or entire portions of a sentence. Single letters, though their shapes must be familiar, are perceived merely as parts of a whole.

To a typesetter or manufacturer of phototypographic alphabets the most important factors are, therefore, harmoniously balanced white spaces around the letters, open counters, and precise adjustment of the spacing between characters.

The term typographic quality has to be considered from two points of view, which may be exemplified as follows: a newspaper reader will hardly consider the screening or break-up by scanning lines of a wirephoto an actual communication-impairing factor. On the other hand, he will reject as unacceptable a blurry, poorly printed half-

tone illustration in a travel folder or a catalog. Precisely the same distinction holds true for the area of typographic legibility. The visibility and legibility of printed matter intended merely for information or reference does not necessarily have to attain the same quality level as that of books in the literary field.

II. Photo-typography

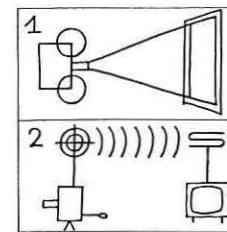
For 500 years the technology of type composition had adhered to basically unaltered principles. Metal composition—by hand or machine—was able to satisfy all requirements of the printing and publishing fields. Then, a mere 20 years ago, new composition techniques were perfected because conventional methods of typesetting technology were no longer able to cope with incessantly growing amounts of information. The invention of photographic composition can therefore not be termed a mere coincidence. It grew out of a sociological and technological necessity, and it enabled the graphic arts to face the challenges of the future.

During the relatively short developmental period which photo-typography passed through during the last two decades, we can already distinguish among several photo-composition equipment generations, two of the basic ones shall be mentioned here:

1. Machines which operate exclusively along photographic/mechanical principles. Type is composed by direct, projective exposure of a character image embedded in a negative film alphabet matrix or grid.

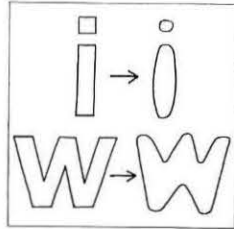
2. Machines which utilize character forms converted into electronic impulses and “written” or generated on a cathode ray tube (CRT) for photographic projection onto film or paper.

In order to explain these two principles we might use the following analogies. The first group of machines would be comparable to a movie theatre. Light is projected directly through a film strip and casts an image onto a screen. The second group could be compared to television transmission. In the television studio a picture is converted into electronic impulses which in turn are received by our antenna and converted into a picture on the tube of our receiver.



Two photo-typesetting generations: direct photographic exposure, and electronically resolved CRT character imaging.

A clear distinction between these two phototypographic composition principles is eminently important. And a simple numerical comparison may further elucidate that difference: equipment in the first category will never exceed exposure speeds of 100,000 characters per hour, while equipment in the second category is able to attain hourly speeds from 100,000 characters on up to yet undefined limits of millions of characters.



(Left) normal character design; (right) distortion due to fast exposure.

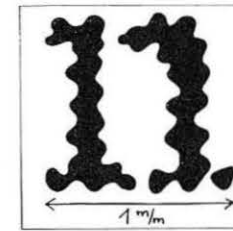
Exposure in "classical" photo-composition machines
Speed is thus the important distinguishing factor between the two methods of photo-composition. Every amateur photographer is aware of the basic rule that a longer exposure results in a sharper picture. In the first group of photo-typesetting machines, the exposure speed is limited. The adjacent illustration pictures an *i* which has been exposed very fast. The dot has diminished in size, while the vertical stem of the letter has experienced a noticeable widening in the center. The proportion of light passing through the negative character image is related to the surface area; in other words, a small opening passes proportionately less light than a larger one. Based on this physical phenomena, the *w* shows a considerable swelling of the diagonally connected strokes.

From this we can deduct that "classical" photo-composition devices (those utilizing negative character images) possess definite limitations with regard to speed and quality. A proportionately exact exposure time for all parts of the letter is immensely important for qualitatively satisfactory phototypographic reproduction.

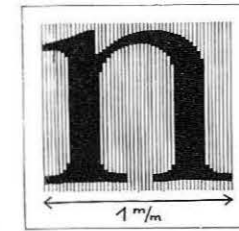
The raster of a cathode ray tube

In the new electronic character generation methods, the individual letter is no longer exposed as a whole but is resolved—depending on the particular system—into a multitude of dots or lines. Every one of those elements is generated with precisely *identical* intensity so that the reproduction of the entire character is *always faithful* to its designed form.

Today's typographers are, nevertheless, disturbed by the fact that in CRT typesetting the



6-point *n* broken up by 200-line halftone screen.



6-point *n* screened by vertical strokes by the Linotron 505 (512 lines per cm.).

outline of the letter is no longer entirely smooth, but subject to a stair-step, grid-pattern effect. An aversion to screened typographic characters in letterpress halftone engravings or even in rotogravure printing is quite justified. That negative attitude, however, must not be transferred to CRT typesetting since the resolutions utilized here are *considerably* finer than the screens of ordinary halftone printing. With the addition of the normal effect of printing, the screen or resolution becomes so insignificant that it is no longer perceivable by the naked eye.

The Linotron 505, for example, works with a screening system which resolves the characters into vertical strokes. The machine offers two choices of character resolution: 650 lines-per-inch for fast, inexpensive type composition and 1300 lines-per-inch for high-quality composition.

Limitations of typographic quality

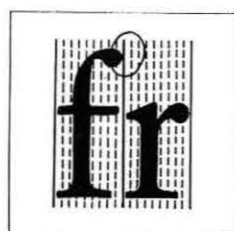
The first category of photo-composition, that of relatively "slow" photo-mechanical equipment, presents practically no quality-inhibiting limitations except for those inherent in exposure-time problems mentioned earlier. In fact, this method should lead toward a constant improvement in typographic quality since photo-composition opens up possibilities which metal composition has never been able to attain: a complete liberation from the rigidity of metal, the width of the matrix, and so on.



Liberation from the rigidity of metal, achieved in "classical" photo-composition.



On the Linotron 505, italic characters are resolved into oblique lines.



The vertical character resolution of the Linotron 505 system does not permit kerning.

The following points are worth mentioning with regard to the second category, that of high-speed, cathode-ray-tube typesetting. The kerning of roman (upright) letters (for instance, an f or j) is impossible since the characters—at least on the Linotron 505—are electronically "written" with vertical strokes. Contrary to the technical limitations of the Linotype machine where kerning is impossible because of the rectangular shape of the matrices, however, the Linotron 505 permits kerning of italic type styles since those are created by means of a special electronic-optical system of obliquing the resolution lines.

III. The Future

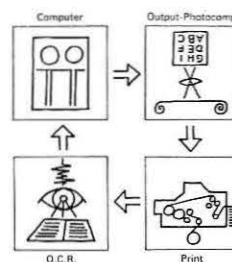
The constantly increasing need for information results in faster type composition. The configuration of text typefaces must retain international validity. Their selection and reproduction are governed by areas of application and by readership requirements. From various aspects, type and typography can be divided into two categories: (1) Texts for instant, quick information. In this category, a lower typographic quality is acceptable in favor of higher composition and printing speeds. In the future, type in this group will more and more be set as the result of computer output and, as the circle closes, be automatically read as further input by OCR (Optical Character Recognition) equipment. Typography in this category will show a tendency toward smaller type sizes. (2) Texts which, based on

their contents and length, necessitate continuous reading without discomfort even after prolonged periods of reading time. In this category, the design and reproduction quality is highly taxed, if it is to fulfil its function in an optimal way. As a rule, type sizes that tend to be larger will be employed here.

We must cope with the fact that quality and speed are almost invariably diametrically opposed to each other. Changing a 500-year-old technology is nothing less than a radical decision for a printer. Before he purchases a photo-composition machine, he has to define clearly the customer and sales structure of his firm and the kind of typography for which the equipment is to be utilized.

It is furthermore important for him to know that companies with long experience in the manufacturing of metal typefaces are handling the redesign and adaptation of typefaces for photo-composition. (In 1968 the Stempel A.G. in its modern plant in Frankfurt, Germany, began the manufacture of alphabet grids for the Linotype photo-composition systems Linofilm Super Quick and Linotron 505.)

We may confidently assume that the new typesetting technology, if it is applied understandably, will result in a rise of typographic quality levels rather than in a deterioration of typographic design. The beauty of our typography is assured for the future, although it has to be adjusted to the new technology. One may be inclined to state that our letterforms, because of the assimilation process, are becoming true expressions of the spirit of our century.



The automatic cycle—composition, printing, reading, composition, printing—has to be closed.

Translated by Klaus F. Schmidt, Vice President & Director of Print Production, Young & Rubicam, Inc., New York City.

Reading in the Medieval Monastery

Both in the Rule of St. Benedict (sixth century) and in other later monastic customs there are directions setting out how books should be read in the monastery. The Constitutions of Archbishop Lanfranc—composed before 1089—provide a good account of the arrangements for the giving out of the books to the brethren on Monday after the first Sunday in Lent: “Before the brethren go in to chapter, the librarian should have all the books save those given out for reading the previous year collected on a carpet in the chapter-house; last year’s books should be carried in by those who have had them and the librarian must warn them that this is to be done, in chapter on the previous day; . . . the librarian shall then read out the list of the books which the brethren had in the previous year. When each hears his name read out he shall return the book which was given him to read, and anyone who has not read in full the book he received shall confess his fault prostrate and ask for pardon. Then the aforesaid librarian shall give to each of the brethren another book to read, and when the books have been distributed in order he shall at the same chapter write a list of the books and those who have received them.” Similar directions are to be found in most monastic ordinals for men and women alike. It is improbable that the reading in monasteries was solely confined to the books solemnly given out in the way just described. This was the minimal requirement and those who had time and inclination could have access to other books. It must always be remembered that reading was not an easy matter in the Middle Ages and was often a slow business, for private reading was mumbled in a low voice.

Excerpted from “The Monastic Library” by Francis Wormald in *The Year 1200: A Background Survey, II* (New York: Metropolitan Museum of Art, 1970), 170.

An Index of the Quality of a Hyphenation Algorithm

Lindsay Molyneux

During the development of hyphenation algorithms some measure of performance is needed. A single parameter index is proposed and it is suggested that it might be used to assess hyphenation algorithms in general.

The need for hyphenation, that is the truncation of a word by a hyphen at the end of a line, arises when text is being set in type with a justified right-hand margin. In English there are no hard and fast rules as to where a hyphen may or may not be used, and the design of a computer algorithm is very much a process of trial and error. An essential part of this process is some method of judging whether a change in the algorithm leads to a better or worse performance. A simple and widely used index is often called “efficiency.”¹ This is calculated by using the algorithm to hyphenate a list of words and then dividing the number of hyphens that agree with some authority (good hyphens) by the number of hyphens listed by the authority. This gives a rough measure of the quality of the algorithm but the difficulty is to know what to do about the hyphens that do not agree (bad hyphens). These can be expressed as an error, but then the trials yield two numbers, which may be difficult to interpret in that an increase in efficiency may be accompanied by a decrease in accuracy. The problem then is to express the quality of the algorithm in one parameter. The core of the solution offered here is founded on the belief that bad hyphens have a more profound effect on the typographical process than have good hyphens. This is because a bad hyphen will probably need correction whereas the lack of a good hyphen may simply lead to the spaces on some lines being greater than normal.