

Form, pattern & texture in the typographic image

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Abstract

In this essay we examine two fundamental typographic principles, size and combination, and show that out of their interaction emerge three qualitative levels of the typographic image: form, pattern, and texture.

Preamble

This essay was originally published in 1989 in the journal *Fine Print: The Review for the Arts of the Book* (vol. 15, no. 1). In the intervening three decades, the terrain of typography has shifted, and many books, as well as other forms of typographic texts, are now read on digital displays, not in print. Discussions of typographic art must now consider analog and digital, in-print and on-screen, long-form and short-form texts. Hence, looking back on this essay of thirty-two years ago, I see that some of my views have changed in light of new media, new knowledge, and new discoveries about old knowledge.

The parts about vision science could and certainly should be updated. Since the 1980s, reading scientists have discovered more about the visual processes underlying reading, and many recent findings appear relevant to understanding typography, and may at least expand our perception of its richness. But, to rewrite this essay to include all the newer technological developments in typography and the scientific discoveries pertaining to reading would force it into a book length disquisition. Instead, the essay appears here as originally written because its basic distinctions are, I believe, still the same; the shift to digital typography has not changed them.

There are a few additional references and illustrations that touch on selected topics in reading science. Also, some of the original illustrations have been replaced with slightly different images, but their purposes within the essay are unchanged. The endnotes are marked in the main body of text by numbers in parentheses, e.g., (1), and then listed by number at the end of the essay.

The original print essay was composed in Lucida Bright, a typeface design first introduced in *Scientific American* magazine in 1987 and later released for general use. This republication for *TUGboat* uses Lucida Book, a new variant of Lucida, still under development but making its inaugural appearance here.



1 Introduction

In her famous essay, “The Crystal Goblet, or Printing Should Be Invisible”, Beatrice Warde argues that typography is not an art.

Type well used is invisible as type... That is why it is mischievous to call any printed piece a work of art, especially fine art: because that would imply that its first purpose was to exist as an expression of beauty for its own sake and for the delectation of the senses. ... printing in English will not qualify as an art until the present English language no longer conveys ideas to future generations and until printing itself hands its usefulness to some yet unimagined successor. (1)

In a lesser-known but no less important essay, “Clay in the Potter’s Hand”, Jan Tschichold argues that typography is an art:

Decisions on matters of higher typography, such as in a title page, need a really highly developed taste, related to what is needed in creative art. They may produce forms which are quite as perfect as good painting or sculpture. From the experts they should receive even more respect since the typographer is more strictly bound than any other artist by the unchangeable wording of the material before him. None but a master can call the dead leaden letters to true life.

Perfect typography is certainly the most elusive of all arts. Out of stiff, unconnected little parts a whole must be shaped which is alive and convincing as a whole. Sculpture in stone alone comes near in its obstinacy to perfect typography. For most people it offers no special aesthetic charm as it is as difficult of access as the highest music... (2)

Warde bases her argument on pragmatics: because typography is useful, because it conveys ideas, it cannot be art, for art is, by implication, aesthetic and sensual rather than utilitarian and rational. Tschichold bases his argument on sophistication, in the sense of complexity or refinement: because typography can be as developed, perfect, difficult, and elusive as the fine arts, it must be an art itself.

In claiming that the typographic whole is constructed from elementary parts, that it is greater than the sum of its parts, and that it can be alive, Tschichold is espousing “holism”, a philosophy

which asserts that complex systems exhibit emergent characteristics that cannot be predicted from knowledge of their components—simply put, that the whole is greater than the sum of its parts—and “vitalism”, a relative of holism, which says that a certain kind of complex system possesses a vital, living essence that does not exist in its constituent parts.

Typography is a complex system which comprises type faces, which in turn comprise alphabets, which in turn comprise letters, all of which may be selected, combined, and arranged according to many different principles in a vast number of ways. The perceptual effect of a typographic work cannot, according to a holistic view, be deduced from simple knowledge of the individual letterforms.

What Warde and Tschichold both are trying to do in these apparently contradictory essays is to define and understand the aesthetic principles of typography. They both observe that most readers do not notice good typography. Nevertheless, because printed text is a dominant visual experience of modern civilization, those readers will spend hours a day and years in a lifetime viewing printed pages.

Therefore the principles that govern the typographic image are potentially important to everyone who works with printed texts—writers, editors, publishers, teachers, librarians, and bibliophiles—as well as to the printing historians and typographic designers who scrutinize typeset pages with professional eyes.

In this essay we examine two fundamental typographic principles, size and combination, and show that out of their interaction emerge three qualitative levels of the typographic image: form, pattern, and texture.

2 Size

Variation of size within a text is one of typography’s signal contributions to the art of literacy. Size variation was not unknown before typography—it can be found in Latin and Greek alphabetic manuscripts, Egyptian hieroglyphic inscriptions, and Chinese logographic brush writing and block printing, but it has developed in typography to a greater degree than in those chirographic, epigraphic, or xylographic traditions.

Multiple sizes of type in a text are not strictly necessary, either for sense—typewritten texts composed in a single size of type have served authors, editors, teachers and students well for over a cen-

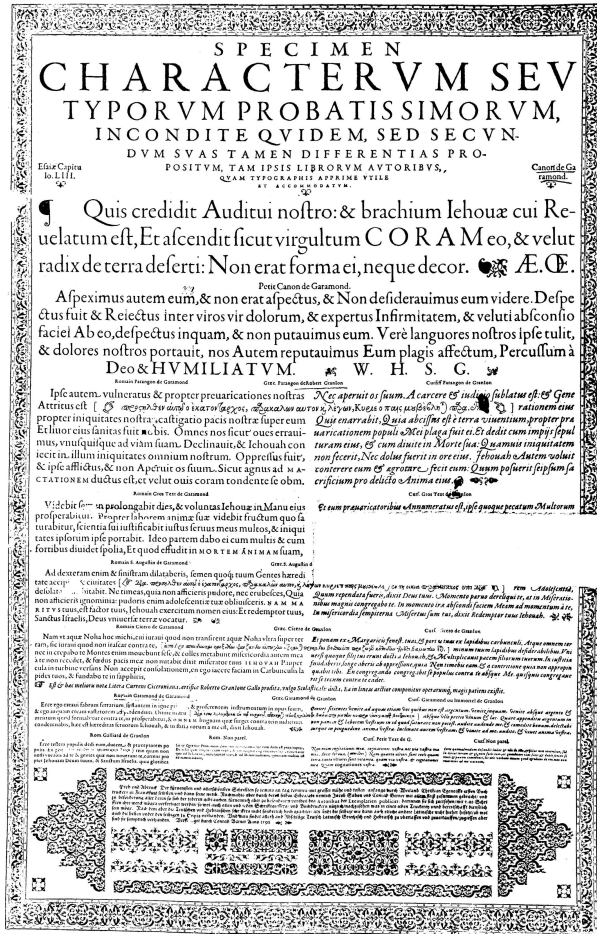


Figure 1: The Konrad Berner type specimen, Frankfurt, 1592. See note (3).

tury—or for beauty—certain incunabula composed only in one size of type are still regarded as paragons of typography. Yet, variation of type size makes text clearer, more dynamic, and more engaging. Size variation is a mainstay of typographic design. Without it, the modern book would be dull, and the modern newspaper impossible.

Size is so important to typography that the creation of a spectrum of different sizes of type occupied the careers of the greatest punchcutters of the golden age of typography. After Claude Garamond cut his first definitive romans, like the St. Augustin size (approximately 14 point) in Jacques DuBois’ *In Linguam Gallicam Isagoge* printed by Robert Estienne in 1531, three generations of punchcutters labored to create additional sizes in Garamond’s idiom. The Konrad Berner Foundry type specimen of 1592 (fig. 1) shows the Garamond style of roman face available in a series of sizes from Canon (ap-

proximately 48 point) to Nonpareil (approximately 6 point), cut variously by Garamond himself, Robert Granjon, Pierre Haultin, and Jacques Sabon. Christopher Plantin’s folio type specimen of 1585 shows a similar range by most of the same hands, with yet larger sizes of roman by Hendrik van den Keere (though in a style noticeably different from Garamond’s). Toward the end of the sixteenth century, Guillaume Le Bé I and Jacques de Sanlecque also cut sizes of roman in the Garamond style. Moreover, Granjon in his long and prolific career cut many sizes of italic faces in his own distinctive styles, examples of which are also shown in the Berner and Plantin specimens. (3)

Why is size so useful? Tschichold’s comparison of typography to music suggests analogies that may illuminate the role of size in typography. Large letters are used for emphasis in text, as loud notes are used for emphasis in music or loud voices in conversation. Hence, size in type is somewhat like loudness or dynamics in music. Just as different parts of a musical composition are loud or soft (in musician’s terms, forte or piano) different parts of a text are large or small.

Type size is more closely analogous to musical pitch, but in a spatial rather than a temporal dimension. In typography, spatial frequency is the number of black and white alternations per unit of distance, just as musical frequency is the number of acoustic vibrations per unit of time. In a given length of line, a small size of type fits more letters, and hence more alternations of black stems with white counters and spaces, than does a large size; hence, smaller type has a higher spatial frequency. Here we see chains of “minimumum” at different sizes:

minimumumini
 minimumumini
 minimumumini
 minimumumini

A typeface that is available in a range of sizes is like a musical instrument which can produce a scale of notes of different pitch. A typographic composition that includes different type sizes thus comprises “notes” of different visual pitch, just as a musical composition comprises notes of different audible pitch. When a reader views a whole page, different type sizes are perceived simultaneously, thus constituting a kind of spatial harmony; when one

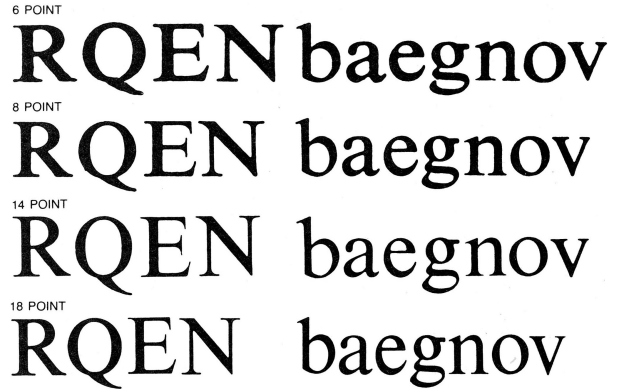


Figure 2: Times Roman fonts of different design sizes, scaled to the same x-height to show proportional changes according to scale. Courtesy of Kris Holmes.

reads a linear text, the types are perceived sequentially, thus constituting a kind of spatial melody.

An analogy can also be drawn between the visual qualities of the typographic notes produced by a typeface, and musical “timbre”. Typographic timbre is a complex visual sensation resulting from the interaction of the proportions, details, and spacing of the typeforms, just as musical timbre is a complex acoustic sensation that results from the sum of the harmonics (partials or overtones) produced by the shape and design of an instrument. A typeface family that includes related variations, such as roman, italic, and bold (and perhaps sans-serif as well) permits the typographer to adjust visual timbre somewhat independently of spatial frequency or size. (4)

A concept related to size is “scale”. A scale is a fixed series of measures, and hence to scale type is to enlarge or reduce it. When scaling leaves letter proportions unchanged, it is termed “linear”. Linear scaling is standard in photographic and digital typography. Opposed to linear scale is non-linear or optical scale, adapted to the eye rather than the machine. Harry Carter, in his article “The Optical Scale in Typefounding”, demonstrates that the traditional proportions of typeforms differ according to whether type is large, medium, or small (fig. 2). In particular, he shows that type designed for a small scale tends to be wider, have a larger x-height, thicker hairlines, and more exaggerated serifs, joins, and terminals than type for a large scale. (5)

Similarly, Daniel Berkeley Updike observes that, “A design for a type alphabet that may be entirely successful for the size for which it is drawn, cannot

be successfully applied to all other sizes of the same series. Each size is a law unto itself...". (6)

Traditional punchcutters and scribes made such proportional changes in order to optimize legibility. Recent research in visual perception suggests that such proportional changes are necessary because the human visual system has non-linear sensitivity to visual features of different spatial frequencies (fig. 3). (7)

Today, photographic and computer techniques can render almost any size of type with ease and precision. Type size has become a continuum instead of a sparse series of fixed sizes and proportions. Because innumerable fine gradations of size are now possible, the typographer must strive to understand the principles that govern the appearance of types at all sizes.

The range of sizes in text is commonly divided into three main scales: large, medium, and small. (8) These refer to apparent size more than physical size. Apparently small type may be physically small, e.g., 6 point type in a newspaper classified advertisement read at a distance of twelve inches, or physically large, e.g., two-foot high type on a billboard read at a distance of 288 feet, but both appear to be the same size because they subtend the same degree of visual angle at the retina of the eye, namely 0.4 degrees of visual angle in this case.

In general, large scale type is used for the display of particular words or phrases, as in titles; medium scale for the main or body text, and small scale for reference text, like footnotes in books or classified advertising in newspapers. However, the actual sizes depend on context. In a book, the medium scale text may be composed in 12 point and small scale footnotes in 9 point, whereas in a newspaper, the medium scale text may be in 9 point and the small scale classified advertising in 6 point. (8)

The textual significance of a given size of type is based on relative scale—the relationship of a given size of type to the other sizes of type on the page. For example, a small amount of large type positioned above a large amount of smaller type usually marks the former as a title or heading for the latter, whatever their actual sizes may be. Relative scale has meaning, whereas absolute size is merely a physical fact.



Figure 3: Superimposed letters F E D have been individually filtered into separate spatial frequency bands to which the human visual system is differentially sensitive. The large F is rendered within a band of high frequencies, mainly edges, that make the letter identifiable at a close viewing distance around one to two feet (30 to 60 cm). The large E is within a band of middle frequencies, mainly interior form, that make it more identifiable at a distance around three to four feet (90 to 120 cm). The large D lies within a band of low frequencies, mainly basic shape, that make it most visible at around eight to twelve feet (240 to 360 cm). *TUGboat* readers may experiment to find optimal visibilities by varying viewing distances. Identifiability of the letters may also depend on viewer eyesight and the ambient illumination.

At lower right, the superimposed small letters—one eighth the size of the large ones—are rendered within the same frequency bands as the large ones, respectively, but because the spatial frequencies reaching the eye are increased by smaller size or greater distances, followed by filtering out of high frequencies in the visual system, *TUGboat* readers may find the E or D more visible at normal reading distances, and the D most visible at greater distances. It would be intriguing to read a text composed in a font like this, if one is possible, which reveals different texts depending on reading distances. The authors of this study state, “Thus, large letters (and coarse square-waves) are identified by their edges; small letters (and fine squarewaves) are identified by their gross strokes.”

See note (7) with reference to Majaj et al. for further explanation. Image courtesy of Denis Pelli.

**Noli querere fieri iudex nisi valeas vir-
tute irrumperere iniquitates: ne forte re-
rimescas faciem potentis: et ponas
scandalum in agilitate tua. Non pec-
ces in multitudine civitatis: nec te im-
mittas in populum: neque alliges dupli-**

Figure 4: Text composed in type based on the Textura script, so named because of its woven appearance. From the Gutenberg Bible, ca. 1455, the first European book printed from movable type. Courtesy of the RIT Cary Graphic Arts Collection.

3 Combination

In text composition, size is always associated with another fundamental typographic principle, combination, as a direct consequence of the nature of language.

As a medium of communication, typography is twice removed from its content. At the first remove, writing is a visual representation of language, and at the second, typography is an industrialized representation of writing. To the reader, the letters that compose a text are recognized in passing but are not themselves objects of contemplation; rather, the words, and behind them, the ideas expressed by the text are of primary interest. As if to acknowledge these two aspects, the word “text” has dual meanings. First it is the printed artifact—the perceptual object, and second it is the linguistic construction—the conceptual object. Although text is used mainly in the latter sense today, its etymology suggests the former, as the modern word is derived from Latin *textus*, a weaving, referring to the woven pattern created by written letters arrayed on a page. (9) (See fig. 4.)

Because the art of weaving involves the creation of a two-dimensional fabric from a one-dimensional thread, an obvious analogy with typography can be drawn, for speech is a one-dimensional string in time woven by typography into a two-dimensional plane in space. As the revolutionary Russian typographer El Lissitzky observed, “We have two dimensions for the word. As a sound it is a function of time, and as a representation it is a function of space.” (10)

Typographic weaving is composition, the repetition and recombination of a small number of letter-

forms into strings and the assembly of those strings into masses of text. It reflects what the French linguist André Martinet has called the “double articulation” of language. (“Articulation” here being itself a *double entendre*, meaning both segmentation into components and pronunciation.) Though apparently of infinite variety, the utterances of a language are constructed from a finite set of meaningful segments—words or “morphemes”—which constitute the first articulation. The words themselves are constructed from a much smaller set of sound units—“phonemes”—which constitute the second articulation. A language may contain myriads of words but will have fewer than a hundred distinct sounds. English, for example, has some forty-five phonemes, and at least several hundreds of thousands of words. Since there are so few individual phonemes in relation to the large number of words, each phoneme is repeated many times in many combinations. (11)

To represent language in a graphic medium, typography likewise utilizes the repetition and recombination of elements. In alphabetic typography, the graphic signs or “graphemes” are letters. In logographic typography (used for Chinese, Japanese, and Korean in varying degrees) the graphemes are characters. Individual letters signify sounds or phonemes (the second articulation), and combinations of letters (or single characters in a logographic script) signify words or morphemes, the first articulation. As is true for the phoneme, the single letter generally has no meaning by itself; its significance lies in its differentiation from the other letters, and its combinations with them to produce higher-level meaningful segments.

4 The typographic image

The interaction of size and combination creates three levels of the typographic image: form, pattern, and texture. Each level contains a range of sizes in varying degrees of combinatory complexity. Although size is a quantitative aspect of type, the emergent levels of the typographic image are qualitative.

Form

The design of a letter is a study in form (fig. 5). The letterform is a dualistic rendering: black and white, intaglio and relief, figure and ground, on and

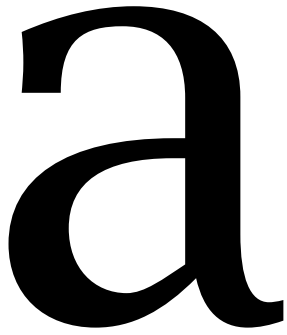


Figure 5: The ‘a’ of Lucida Book, font size 216pt.

off. The contour that separates and defines the polarities of the letter image creates the interaction between letterform and counterform, interior and exterior, positive and negative space. The resultant perception includes lines, such as fair curves, straight edges, smooth joins, and sharp corners, as well as shapes, such as solid regions, empty hollows, delicate taperings, and abrupt terminations.

At the level of form, the letter is viewed at a large scale. In the large letter, interior area dominates contour line because of a geometrical relationship known to the Greeks: the area of a form increases in proportion to the square of the size, whereas the length of the contour that defines the form increases in direct proportion to the size. When a letter is large, the area of the interior is large in proportion to the line of the contour, and much of that region is relatively far from the contour. Hence, the mass (or void) tends to dominate the image. However, this tendency is partly counteracted by mechanisms in the human visual system, such as lateral inhibition, that extract edges from images and de-emphasize monotonous surfaces. (12)

At its largest perceptual size, the letterform is isolated. Extracted from the context of the alphabetic system, the isolated letter becomes an object of contemplation, not meaning. It is pure form, its semiological role vacated because alone the letter has no significance. It is an abstraction. As Eric Gill wrote, “Letters are not pictures or representations. They are more or less abstract forms.” (13)

Form invites abstract analysis. Renaissance humanists and artists analyzed the shapes of letterforms with the compass and straightedge of Euclidean geometry (fig. 6). Enlightenment academicians used the grids of Cartesian geometry. Today’s

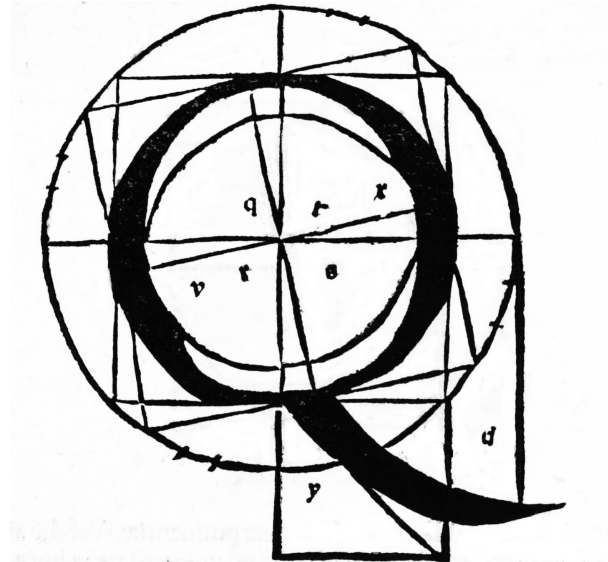


Figure 6: Capital Q letter construction by Sigismondo Fanti, *Theorica et practica ... de modo scribendi fabricandique omnes literarum species*, Venice, 1514.

computer scientists use the mathematical formulae of splines and conic curves.

Because letterforms can easily be scaled to any size by modern typographic technology, the finest details of the forms, formerly examined only by experts, can now be appreciated by everyone. The letter under the lens of photographic and digital typography is like the work of art under the lens of the camera, as discussed by Andre Malraux in *The Voices of Silence* (1978):

In an album or art book the illustrations tend to be of much the same size. Thus works of art lose their relative proportions; a miniature bulks as large as a full-size picture, a tapestry or a stained-glass window... In this way reproduction frees a style from the limitations which made it appear to be a minor art.

Indeed, reproduction (like the art of fiction, which subdues reality to the imagination) has created what might be called “fictitious” arts, by systematically falsifying the scale of objects; by presenting oriental seals the same size as the decorative reliefs on pillars and amulets like statues... Sometimes the reproductions of minor works suggest to us great styles which have passed away—or which “might have been”. (14)

At a large scale, the letterform ceases to be a minor art, and takes its place with the forms of painting, sculpture, and even architecture as objects of study and contemplation. The letter as form is displayed, as Beatrice Warde said above, “as an expression of beauty for its own sake and for the delectation of the senses”.

The effect that the forms of letters will produce when combined into text is often impossible to predict because many of the characteristics of an alphabet design emerge only *en masse*. The next level of the typographic image, the level of forms in combination, is the level of pattern.

Pattern

Combined into words and lines of text, the forms and counterforms of individual letters become elements of a periodic structure. The shapes of stems, bowls, serifs, and other features of a letter relate to similar features of other letters, as the forms of counters inside a letter relate to the counters of other letters and to the spaces between letters. Because there are only a few different letterforms in an alphabet, each form is repeated many times in many combinations, and the relationships between forms and counterforms extend beyond near neighbors to entire lines and columns. The sum of these relationships is a pattern.

The level of pattern occurs at a medium scale, where the interior area of a form no longer dominates the contour line. Instead, these two different aspects of a geometric figure tend toward equilibrium. Because much of the interior area of a form lies close to the contour, the interaction of contours with areas, edges with surfaces, gives the text image an active quality.

A text pattern is complex because it results not only from the repetition of whole letters, but also of letter parts. Letters are constructed from more primitive graphic elements. In handwriting, these elements are kinesthetic movements—gestures and strokes—which leave graphic traces; in type design, they are graphic features which can be consistently combined, such as stems, bowls, diagonals, cross bars, hairlines, joins, serifs, and terminals. Because the letters share a small number of elemental features, the structure of the text pattern is derived from symmetries and transformations of repeating letter parts as well as from repetitions of fully formed letters.

This constructive, systematic nature of typefaces is a result of the formal interactions of the letters during a long, common history. The development of the alphabet shows a transformation of originally iconic or pictorial signs, linked by relationships of resemblance to the objects signified, into abstract, symbolic shapes which have stronger formal linkages to each other than to the things they signify. The alphabet represents a system of sounds, not a collection of isolated entities, and thus no letter exists in isolation. Graphically, each letter must be unique in order to carry its particular significance, but it must also be fashionable by the same means as the others, writable by the same hands and tools, constructible from the same elements.

Pattern begins with the word and comes to full flower in the line and column. The line of type is a one-dimensional pattern, like a frieze, based on the repetition of geometric figures in a line. For efficient packing, the continuous line of type is cut into segments which are arrayed in columns, creating a two-dimensional type page which, like wallpapers, tilings, and fabrics, is based on repetition in a plane (fig. 7). This structural relationship of type to pattern has been familiar to typographers for centuries. Robert Granjon in the sixteenth century and Pierre Simon Fournier in the eighteenth excelled in the creation of floral forms or fleurons that could be combined into ornamental patterns to accompany their typeforms combined into text. (15)

The patterns that emerge from text are nevertheless different from those of ornamental friezes and tilings because the latter, though often beautiful and intricate, convey relatively little information despite multiplicity of forms. The mathematical principles that govern the tiling of the plane make it possible to predict exactly when and where a given geometric element will occur in a pattern (fig. 8). Hence, there is little new information derived from each repetition of the pattern. (16)

A third dimension of pattern is found in the codex form of book, which, like a crystal, is composed of parallel text planes in space. The codex book is, however, a cognitive more than a visual structure, since it relies on the reader’s memory of the patterns on successive pages rather than on simultaneous perception of them. The third dimension of book structure is often emphasized in modern books created as art objects or experiments.

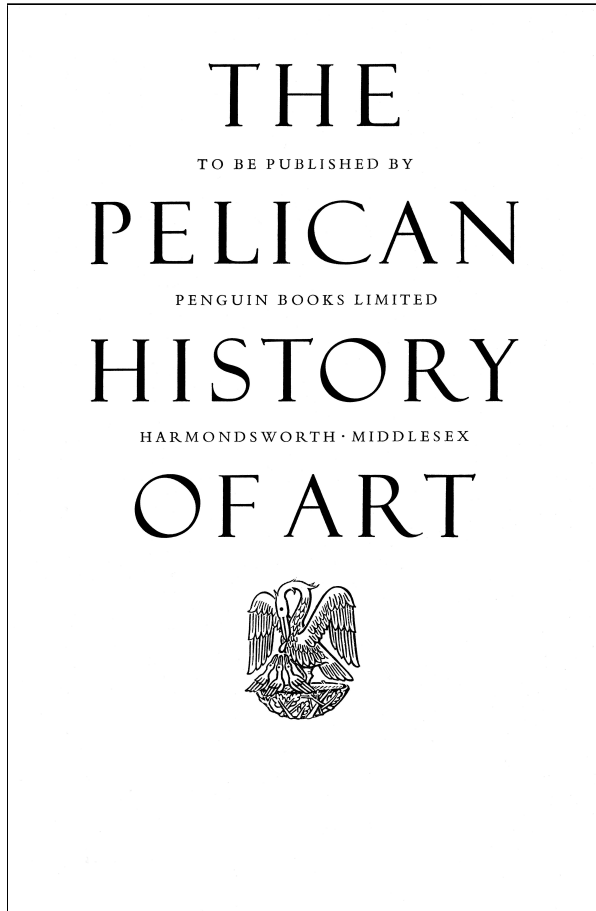


Figure 7: Page of prospectus designed by Jan Tschichold, 1947. The individual forms of the large capitals are evident, and the beginnings of patterns are seen in the word combinations. The lines of smaller capitals exhibit stronger patterns, while individual forms are less evident.

So-called “hyper-texts”, used for reading and accessing complex computer data bases, have structures that rely on the computer’s memory to keep track of page sequence, which can be arbitrarily complex and convoluted, and seldom follows the regular, linear sequencing of the codex. Yet, so far, the basic designs of the typographic pages of hyper-texts remain repetitive and book-like.

Typographic tilings are only partially predictable. The periodicity of a typographic pattern is approximate rather than exact, flexible rather than rigid, surprising rather than predictable, because the text constantly changes. The occurrence of a given letter or word space in a particular position is determined not by rules of geometry but by rules of language and the idiosyncratic choices of an author. (17)

Charles Bigelow



Figure 8: Arabesque after Granjon, from *Kleines Spiel mit Ornamenten* by Max Caflisch (Berne: Angelus-Drucke, 1965), reconstructed by Jacques André (*Petits jeux avec des ornements*, jacques-andre.fr/ed/caflisch-jeux.pdf, 2009, p. 63).

The pattern made by a typeface is greatly influenced by the amount and distribution of space between lines and between letters. The typical text column makes a striped pattern which the typographer can augment or diminish by using more or less leading—interline spacing. Within the line, visually even letterspacing is often held to be ideal. A regular spatial frequency of alternating dark stems and white spaces creates a smooth rhythm with a look of stability and repose (as in the earlier “minimum” example). Techniques for the regular spacing of capitals have been described by Tschichold and for the even fitting of lower case by Walter Tracy. (18)

Perfectly even spacing is difficult to achieve in practice because the arbitrary shapes of letters inevitably cause some degree of irregularity of fitting in standard typographic technology. Not all letter combinations seem equally spaced. But some degree of irregularity in letterforms and spacing may be preferable to monotonous regularity, just as in music, where slight inharmonicity of partials, or overtones, creates the complex, wavering quality that makes a piano tone “warm”, whereas precisely harmonic partials produce bland sounds. (19)

In contemporary advertising typography, the unstable, restless patterns of tight letterspacing are preferred. The busy, frenetic effect of so-called “sexy” spacing, in which the letters tend to rub up against each other, are common in the typography of mass market persuasion, where arresting, staccato patterns draw the reader’s attention to texts that might otherwise be ignored. (19A)

Tight packing of letters also magnifies the logographic aspect of typography. Reduction of space between letters within a word emphasizes by contrast the space between words, thus articulating the text into an archipelago of word islands, rather than continuous strings of letters. The semi-crystalline lattice of letters on the page is thus interrupted by holes, but holes that have a purpose and meaning. In typography, the word space has developed as



Figure 9: Three pages from Fournier's *Manuel Typographique*, from left to right, exemplars of form, pattern, and texture. Scaled to approximately 80% of original size.

Although Fournier invented a precursor of our current point system, his *Manuel* uses names for type sizes, as was common in his era. In modern points, the sizes are approximately: Grosses de fonte ('M' in first image) = 96 points high; Palestine (second image) = 24 point body size; Nompareille (third image) = 6 point body size.

a representation of a psychological rather than an acoustic reality, since there are rarely gaps or pauses between words in continuous speech. (20) The importance of the blank space as a logographic mark in English text is indicated by its frequency, greater than e, the most frequent letter.

Further, close letterspacing creates characteristic word images by emphasizing the irregularity of a given sequence of features in a word, thus distinguishing its shape from that of other words. By subdividing the letter pattern into characteristic chunks and gaps instead of a continuous flow, alphabetic typography takes on some of the qualities of logographic Chinese writing.

Texture

The realm of texture is the habitat par excellence of the serious reader, where the text reaches its greatest mass and density and the ultimate visual qualities of the literate image emerge. At the level of texture, line dominates area; forms are obscured; patterns become aggregates. Small, the letters are seen as though at a distance, through an intervening atmosphere, resembling more the attenuated figures

sculpted by Alberto Giacometti than the forms and volumes shaped by Henry Moore.

When letters are seen at a small size, it is difficult if not impossible to discern the exact forms of fine features such as serifs, joins, and terminals, though these are obvious at a large size. Linearity replaces interiority. The area of the interior of the small letter is small compared to the length of the contour, and most of the interior area lies along the contour. At the level of texture, the letter is mainly line, an aspect intensified by the edge-detection mechanisms of the human visual system. Textures are complexes of edges.

Patterns evident at a medium scale become so dense at the small scale that statistical qualities emerge; the density or "color" of the text, its granularity, and its weave can be seen directly. Out of the myriad interactions of features and spaces, texture emerges. That a basic quality of the text emerges from multiplicity was known both to traditional and to modern typesetters. Pierre Simon Fournier observes in his *Manuel Typographique* (fig. 9):

One letter measured singly may seem neither

Form, pattern & texture in the typographic image

Typography is closely allied to the fine arts, and types have always reflected the taste or feeling of their time. The charm of the early Italian types has perhaps never been equalled

Typography is closely allied to the fine arts, and types have always reflected the taste or feeling of their time. The charm of the early Italian types has perhaps never been equalled

Figure 10: A quote from D. B. Updike's *Printing Types*, set in Helvetica (above) and Syntax (below), illustrating an observation from poet Heinz Peyer.

appreciably too big nor too small, but ten thousand composed into printed matter repeat the error ten thousand times over, and, be this never so small, the effect will be the opposite of what was intended. The same trouble also occurs when a stroke is made either too thick or too thin relative to its length, which makes a letter look clumsy and faulty, with out the reason for it being always easy to find out. (21)

One memorable observation on typographic texture was made by Heinz Peyer, a Swiss poet, who said that reading a text composed in Helvetica was like walking through a field of stones, whereas reading a text in Syntax was like walking through a field of flowers (fig. 10). (23)

Chauncey Griffith, designer of twentieth-century news faces, found the ready analogy between textiles and text typography:

But the individual piece of type is like a thread. A single thread might be dyed crimson, scarlet, or pink and the human eye would find the difference hard or impossible to detect. But once that thread is woven into cloth, the color is very apparent. So type must be judged after it is woven into the texture of a paragraph or a page. (22)

Although the level of texture is where most reading takes place, the vocabulary of texture is the least developed of the three levels of the typographic image. At the level of form, terms like line, space, and mass, commonly applied to drawing, painting, and sculpture, can equally apply to type. At the level of pattern, notions of symmetry, homology, and periodicity, commonly applied to tessellations and mosaics, can also apply to type. But at the level of

texture, few standard terms are available. Typographers use “color” for achromatic density—the darkness or lightness—of printed text, or a few ad hoc expressions like “spikey”, “wormy”, or “stolid”, depending on one’s feeling for metaphor. In the realm of texture, poets may need to come to the aid of printers by providing words to describe the images of the “black art”.

Form is often susceptible to logical analysis, and pattern somewhat so, but texture evades precise description because its repetitions are so numerous, its features so small, and its interactions so refined, that the multifarious complexity of the emergent image resists orderly analysis. Texture requires a holistic more than an analytic understanding. This is an aspect of a deeper and larger philosophical difficulty stated by Pascal in his famous comparison of the intuitive mind to the geometrical mind:

These (principles) can be seen only with difficulty, they are sensed more than seen, and it is infinitely difficult to make them known to those who do not sense them for themselves. These things are so delicate and so numerous that a sense of great delicacy and precision is necessary to perceive them and to judge correctly and accurately from the perception, and in most cases it is not possible to prove the judgment logically as in geometry, because not all the necessary principles are available and it would be an infinite undertaking to gather them. It is necessary to see the whole thing all at once, in a single glance, and not by progressive reasoning... (24)

As a consequence of the complexity and refinement of texture, psycho-physical and mathematical studies of its perception have used statistical analyses and formalized notions of clustering, orientation, and brightness. However, the visual elements and arrangements used in such perceptual studies are simple compared to the complexity of letterforms in actual text, and hence such studies, though suggestive, have so far been minimally relevant to typography. (25)

For various purposes, typefounders, telegraphers, cryptographers, and information theorists have made statistical measures of the frequencies of letters and letter combinations in various languages. (26)

When coupled with knowledge of the forms

Quo usque tandem abutere, Catilina, patientia nostra?
quam diu etiam furor iste tuus nos eludet? quem ad finem
sese effrenata iactabit audacia? Nihilne te nocturnum
praesidium Palati, nihil urbis vigiliae, nihil timor populi, nihil

Typography is closely allied to the fine arts, and types have
always reflected the taste or feeling of their time. The
charm of the early Italian types has perhaps never been
equalled; and the like is true of the Renaissance manuscripts

nugwagímḡ łgá dáyaxbt, aga dánmaḡ wíłxba díqłpxix.
łúxwan dáwax wakáyim, łúxwan agúnaḡ alátxwida,
łá::niwa ilkálakiya łdímamt. gałékim, «adí::! kiníkštḡ náyka.
nagəłgát adálutk. idmílaxm á::nga wakádaču ikdúdina.»

Figure 11: Texts in Latin (from Cicero's first oration
against Catiline), English (from D.B. Updike's *Printing
Types*), and Clackamas Chinook (from Jacobs' and
Howard's Clackamas-Chinook Texts) show different
textures resulting from different letter frequencies.
Composed in Syntax-Antiqua.

of the letters, such statistics can partially indicate
texture. For example, Updike notes that differences
in letter frequencies change the appearance of a
type page. He favorably compares Latin text, with
its frequent u's, m's, and n's, infrequent diagonally
stroked y's, and infrequent descenders, to English
text, with its greater frequency of diagonals and
descenders. (27)

Updike's personal preference for the texture of
Latin was, however, a matter of taste more than ob-
jective judgment. The letter frequencies of Latin and
English actually seem rather similar when compared
to those of non-Indo-European languages. Had Up-
dike broadened his literary horizons beyond Eu-
rope and New England to native American texts pub-
lished by his contemporary Franz Boas, he might
have noticed, for example, that literary texts in the
Chinookan languages of the Pacific Northwest have
a plenitude of diagonals and descenders that the
texture of English seems staid, and Latin dull in
comparison. (28) (See fig. 11.)

When the typographic image is understood
to comprise distinct levels of different aesthetic
and functional qualities, the opposing arguments
of Warde and Tschichold can both be seen to be
true. At the level of form, typography is a fine art.
Its works are accessible to the aesthetic sensibility
of the viewer as well as to the intellectual analyses
of the art historian, and its shapes are susceptible,
at least to some degree, to the logical analyses of
the mathematician and scientist. At the level of

texture, typography is a utilitarian craft. Its forms
are aesthetically transparent to the reader, and its
emergent visual qualities, though obvious to the be-
holder as a holistic image, are resistant to articulate
analysis, as its perceptual workings remain for the
most part mysterious to the scientist. Typography
as pattern articulates form with texture, presenting
a bivalent image—formal yet functional, ornamen-
tal yet informational—leading on the one hand
toward the isolated shape and on the other toward
the emergent image. As a whole, then, typography
can be seen both as a tool for thought and as an
object of contemplation, a conveyor of sense and a
delight to the senses.

5 Notes

- (1) Beatrice Warde, "The Crystal Goblet, or Printing
Should be Invisible", originally an address
entitled "Printing Should be Invisible", given to
the British Typographers' Guild at the St Bride
Institute, London, 1932.

Reprinted in *The Crystal Goblet: Sixteen Essays
on Typography*. London: Sylvan Press, 1955;
Cleveland and New York: The World Publishing
Co., 1956. Also reprinted in *The Monotype
Recorder*, vol. 44, no. 1, Autumn 1970.
[readings.design/PDF/The%20Crystal%20
Goblet.pdf](https://readings.design/PDF/The%20Crystal%20Goblet.pdf)

Warde's famous essay enjoys an enduring place
among the best literature of typography, and her
phrase, "until printing itself hands its usefulness
to some yet unimagined successor" was clairvoy-
ant. Nine decades later, her "unimagined successor"
to print is not only imaginable, it is nearly ubiqui-
tous in the digital display of text on the screens of
computers, tablets, e-readers, smart phones, and
the like. The number of smart phones worldwide
is estimated to be greater than six billion and the
number of computers at least 2 billion. Ebooks in
various forms have been estimated to constitute 14
to 21 percent of books published per year.

- (2) Jan Tschichold, "Ton in des Töpfers Hand",
in *Ausgewählte Aufsätze über Fragen der
Gestalt des Buches und der Typographie*. Basel:
Birkhäuser, 1975.

English translation by Hajo Hadler, as "Clay in a
Potter's Hand", in *The Form of the Book*, Robert
Bringhurst, ed. Vancouver, Canada: Hartley &

Marks Publishers, 1991. (Hadler's translation differs somewhat from the one in this essay.)

- (3) John Dreyfus, ed., "Specimen no. 2: Konrad Berner, Frankfurt 1592", in *Type Specimen Facsimiles*. John Dreyfus, general editor, with research by A.F. Johnson, Harry Carter, Matthew Carter, Netty Hoeflake, Mike Parker. London: Bowes & Bowes, 1963.
- H.D.L. Vervliet, Harry Carter, eds., "Specimen no. 17: Plantin's Folio Specimen c.1585" and "Specimen no. 18: The Le Bé-Moretus Collection of Fragments c.1599" in *Type Specimen Facsimiles II*. Toronto: University of Toronto Press, 1972.
- Nicolas Barker, "The Aldine Roman in Paris, 1530-1534". *The Library*, vol. s5-XXIX, no. 1, Mar. 1974, pp. 5-20.
doi.org/10.1093/library/s5-XXIX.1.5
- Harry Carter, ed., *Sixteenth Century French Type-founders: The Le Bé Memorandum*. Paris: André Jammes, 1967.
- More recent research by Hendrik D.L. Vervliet indicates that the St. Augustin roman type used by Robert Estienne in the 1531 *Isagoge* and other books was cut not by Garamond but by a "Maitre Constantin" who cut five romans in the Aldine style for Estienne but of whom little else is known.
- Hendrik D.L. Vervliet, *French Renaissance Printing Types: A Conspectus*. New Castle, DE, USA: Oak Knoll Press, 2010. Simultaneously published in London by the Bibliographical Society and the Printing Historical Society, p. 36.
- (4) Charles Bigelow, Kris Holmes, "The design of Lucida", in *Text Processing and Document Manipulation*, J.C. van Vliet, ed. Cambridge: Cambridge University Press, 1986, pp. 1-17.
- Charles Bigelow, Kris Holmes, "Science and history behind the design of Lucida". *TUGboat*, vol. 39, no. 3, pp. 204-211, 2018.
tug.org/TUGboat/tb39-3/tb123bigelow-lucida.pdf
- (5) Harry Carter, "The optical scale in typefounding", in *Typography* 4, pp. 144-148. London: The Shenval Press, 1937.
- Reprinted as "Optical scale in type founding", *The Printing Historical Society Bulletin*, vol. 13,

1984, pp. 144-148. London: St Bride Institute.
issuu.com/lettererror/docs/harry_carter_optical_scale_in_typefounding

Harry Carter's influential essay is well known to type designers; see, for instance: Tim Ahrens and Shoko Mugikura, *Size Specific Adjustments to Type Designs*. Garching, Germany: Just Another Foundry, 2013.

The first scientific study of the effect of optical scale on legibility, to my knowledge is:

Kevin Larson, Matthew Carter, "Sitka: A collaboration between type design and science", in *Digital Fonts and Reading*, Mary C. Dyson, Ching Yee Suen, eds., pp. 37-53. Singapore: World Scientific, 2016. microsoft.com/en-us/research/publication/sitka-a-collaboration-between-type-design-and-science/

The authors conclude that type designs intended to optimize legibility at small sizes are also optimally legible at large sizes, while designs intended for large sizes are artistically pleasing at large sizes:

The size-specific adjustments made for large sizes do not increase legibility for large sized text. If we want increased legibility at large sizes, we are better served using a small size-specific design. If our goal is instead some level of elegance or personality, then a large size-specific design is appropriate.

A review of a century of research on the effects of typeface features on legibility is:

Charles Bigelow, "Typeface features and legibility research". *Vision Research*, vol. 165, Dec. 2019, pp. 162-172.

- (6) Daniel Berkeley Updike, *Printing Types: Their History, Forms, and Use, A Study in Survivals*. Cambridge, Massachusetts: Harvard University Press, 1937.
- (7) Najib J. Majaj, Denis G. Pelli, Peri Kurshan, Melanie Palomares, "The role of spatial frequency channels in letter identification". *Vision Research*, vol. 42, no. 9, Apr. 2002, pp. 1165-1184. (Source for figure 3.)

Since the late 1970s, there have been several studies of how (postulated) frequency sensitive channels in the human visual system encode features of letters and text for recognition by readers. Evidence has emerged that different sizes of letters

are detected and encoded by visual channels sensitive to different frequencies, although the findings are neither as clear-cut nor as simple as I believed when I wrote the present essay, in 1989.

Reading researcher Gordon Legge, summarizing findings by several researchers, including in his own laboratory, has written:

These empirical results imply that letters of large angular size are identified by channels encoding edge features or other high-frequency components of the letters' spectra. Identification of tiny letters depends on channels that encode coarser features (lower frequencies in units of cycles per letter).

Gordon E. Legge, *Psychophysics of Reading in Normal and Low Vision*. Mahwah, NJ: Lawrence Erlbaum Associates, 2007, pp. 60–65.

The implication that large sized letters are recognized by their high-frequency (sharp) edges, while small sized letters are recognized by their low-frequency (soft) components reminds us of claims made by Harry Carter in “Optical Scale” (1937):

Legibility is all that matters in 6- to 10-point types; so that their successful design is a technical, and not in the ordinary sense an artistic, achievement... In the design of founts from 20- to 72-point the artist comes into his element. The eye dwells on big letters instead of hurrying from one to another as quickly as it can make out their meaning, as it does in reading text-sized types. Every letter must therefore be worth looking at for its own sake... There is no technical virtuosity about the fact of cutting a 24-point letter: the problem is an artistic one. The pleasure given by a fine large type comes from the beauty of the design and the beauty of the workmanship.

The whole problem of adapting type-design to optical susceptibilities is a fascinating and a very difficult one. It is only possible to nibble at it without having proper experimental apparatus and ample time.

Quantitative nibblings of spatial frequencies, or optical susceptibilities, in the recognition of letters, principally of type, include:

Arthur P. Ginsburg, “Visual information processing based on spatial filters constrained by biological data”. Report No. AMRL-TR-78-129-VOL-1/2, Air Force Aerospace Medical Research Lab, Wright-Patterson AFB, Ohio, USA, 1978.

Robert Morris, “Spectral font signatures”. Technical Report of the Department of Mathematics and Computer Science. Boston: University of Massachusetts, 1989.

Robert Morris, “Image processing aspects of type”, in *Document Manipulation and Typography*, J.C. van Vliet, ed. Cambridge: Cambridge University Press, 1988.

Charles Bigelow and Donald Day, “Digital typography”. *Scientific American*, vol. 249, no. 2, Aug. 1983, pp. 106–119.

Charles Bigelow, “On Type: Optical letter spacing for new printing systems”. *Fine Print*, vol. 4, no. 3, Oct. 1977. Reprinted in *Visible Language*, vol. 11, no. 3, 1977, pp. 325–329, visiblelanguage.herokuapp.com/issue/43

(8) Division into three levels of typographic scale probably reveals a culturally ingrained preference rather than a perceptual spectrum. Indo-European languages and cultures, including English, often divide phenomena into three parts, as in the grammatical partitioning of adjectives into positive, comparative, and superlative forms (big, bigger, biggest), or the story of Goldilocks and the three bears, or Caesar’s division of all Gaul into three parts. Had Caesar been a book designer instead of a general, he might have written, “Typographia est omnis divisa in partes tres.”

A scientific analysis based on precise measures of visual size and reading speeds suggests there are two important divisions of typographic scale. In studies beginning in the 1980s, Gordon Legge and co-researchers have discovered a “critical print size” (CPS) below which reading speed decreases precipitously as type size decreases. Above the CPS, reading speed does not appreciably increase but instead reaches a plateau even as size increases. CPS is measured by the visual angle that a font subtends at the retina, which depends on two factors: the physical x-height of a typeface in print or on screen and the distance at which it is read.

As an example, assuming a reading distance of 16 inches (40 centimeters), the CPS of Times Roman (or Times New Roman, or any similar-enough font) is 9 point, giving a CPS of approximately 0.2 degrees of visual angle.

A review of the relationship of critical print size to typography:

Gordon E. Legge, Charles A. Bigelow, “Does print size matter for reading? A review of findings from vision science and typography”. *Journal of Vision*, vol. 11, no. 5, Aug. 2011. doi.org/10.1167/11.5.8

(9) Latin text- and Greek tex- (the “tech-” of “technology” and “technique”, as well as “T_EX”, and the “-tect-” of “architect” and “tectonic”) can both be traced back to a reconstructed Proto-Indo-European root, *teks-, meaning weaving and fabrication. The use of computer technology to weave text reunites aspects of an ancient craft.

A striking conjunction of typography with weaving is in two books woven in silk by a nineteenth century weaving firm in Lyon, France. A small, 20 page book of a poem, “Les Laboueurs”, extracted from a larger work by Alphonse de Lamartine, was digitized and woven in silk on a Jacquard loom by the lace-making firm of J.-A. Henry in Lyon, France. It was exhibited at the 1878 Paris Exposition. The body size of the digitally woven text is small, approximately 8.5 point. “Les Laboueurs” was followed in 1886 by a 50 page book (*Livre de Prières tissé ...*) woven by the same methods, and also elaborately ornamented and illustrated, which won a prize at the 1889 Universal Exposition in Paris, where the newly completed Eiffel Tower was a celebrated phenomenon.

(10) El (Lazar Markovich) Lissitzky, “Our Book”, in *Gutenberg Jahrbuch* 1926 7. Mainz: Gutenberg-Gesellschaft. English translation by Helene Aldwinkel, in *El Lissitzky*, Sophie Lissitzky-Küppers, ed. London: Thames and Hudson, 1980.

(11) Andre Martinet, *Éléments de Linguistique Generale*. Paris: Librairie Armand Colin, 1967. Martinet follows an observation made by Ferdinand de Saussure in *Cours de linguistique generale*, Charles Bally and Albert Sechehaye eds., 1916. English edition: *Course in General Linguistics*, Wade Baskin, trans. New York: The Philosophical Library, 1959.

Articulation into words is a notion familiar to typographic literates because words are separated by blank spaces in typography (though they were not so in classical Greek and Latin manuscripts). “Morpheme” denotes an elementary meaningful unit of language, which may be a word or a significant part of a word. An English noun such as “bird” is

a morpheme, as is the plural suffix represented by the letter “-s” in the plural noun “birds”. Written morphemes may or may not be separated by word spaces, depending on the orthography of a language.

“Phoneme” denotes a psychologically distinguishable sound of speech. Unlike a word, a phoneme generally has no meaning in itself; its role is to be different from other phonemes and to make meaning through its interactions and combinations with them. Articulation into phonemes is familiar to readers of alphabetic scripts because many, though not all, phonemes are uniquely represented by a single letter. In English orthography, for example, the letters b, d, p, and t, among others, represent consonantal phonemes. Most orthographies are not, however, perfectly phonemic. English vowel phonemes, as a notorious example, do not have simple, one-to-one correspondences with the letters of written English. Few languages have more than 100 phonemes, excepting some African Khoisan languages which have a rich repertoire of click phonemes.

(12) Floyd Ratliff, “Contour and Contrast”. *Scientific American*, vol. 226, no. 6, June 1972, pp. 9-20.

David H. Hubel, *Eye, Brain, and Vision*. New York: Scientific American Library, 1988.

See notes (7), (8), and (25) for findings that letter recognition depends on different channels of spatial frequencies, not simply on edges.

(13) Eric Gill, *An Essay on Typography*. London: Sheed & Ward, 1936. Reprinted, Boston: David R. Godine, 1988.

(14) Andre Malraux, “Museum Without Walls”, in *The Voices of Silence*. Stuart Gilbert, trans. Princeton: Princeton University Press, 1978.

(15) John Dreyfus, *French Eighteenth Century Typography*. Cambridge, U.K.: The Roxburghe Club, 1982.

(16) A.V. Shubnikov and V.A. Koptsik, *Symmetry in Science and Art*. G.D. Archard, trans. New York: Plenum Press, 1974.

Branko Grünbaum and G.C. Shephard, *Tilings and Patterns*. New York: W.H. Freeman, 1986.

Hermann Weyl, *Symmetry*. Princeton: Princeton University Press, 1952.

(17) John R. Pierce, *An Introduction to Information Theory: Symbols, Signals and Noise*. New York: Dover Publications, 1980.

(18) Jan Tschichold, *A Treasury of Alphabets and Lettering*. New York: Reinhold, 1966.

Walter Tracy, *Letters of Credit*. Boston: David R. Godine, 1986.

(19) John R. Pierce, *The Science of Musical Sound*. New York: Scientific American Library, 1983.

(19A) Several studies have contradicted the popular hypothesis that decreasing letter spacing increases legibility by merging letters such that words are recognized as whole shapes instead of by their component parts, i.e., letters. A few representative articles: Susana T.L. Chung, “The Effect of Letter Spacing on Reading Speed in Central and Peripheral Vision”. *Investigative Ophthalmology & Visual Science*, vol. 43, no. 4, 2002, pp. 1270-1276.

Using monospaced Courier as the test font, the author found that letter spacing less than that of standard Courier did not increase reading speed, and, on average, apparently decreased it when the spacing was less than approximately 0.9 of standard spacing. Spacing greater than the standard value also failed to increase reading speed.

Denis G. Pelli, Bart Farell, Deborah C. Moore, “The remarkable inefficiency of word recognition”. Letter to Nature, *Nature*, vol. 423, no. 6941, June 12, 2003, pp. 752-756.

The authors state: “Our results indicate that, rather than directly recognizing complex familiar objects, such as words, our visual system detects smaller components—letters or perhaps features of letters—and only then recognizes the object specified by these components.”

Kevin Larson, “The Science of Word Recognition”. Lecture at Association Typographique Internationale, Sept. 2003. docs.microsoft.com/en-us/typography/develop/word-recognition

The author summarizes: “Word shape is no longer a viable model of word recognition. The bulk of scientific evidence says that we recognize a word’s component letters, then use that visual information to recognize a word.”

Relevant discussion is found in:

Gordon E. Legge, *Psychophysics of Reading in Normal and Low Vision*. Mahwah, NJ: Lawrence Erlbaum Associates, 2007, pp. 94-96.

(20) Andre Martinet, “The Word”. *Diogenes* 51, 1965.

(21) Pierre Simon Fournier, *Manuel Typographique*. Paris: Fournier (and Barbou), 1764-66; Harry Carter, trans. *Fournier on Typefounding*. New York: Burt Franklin, 1973.

First edition: Pierre Simon Fournier, Harry Carter, *Fournier on Typefounding. The Text of the Manuel Typographique, 1764-1766*. Translated and edited with notes by Harry Carter. [With a Portrait.] London: Soncino Press, 1930.

(22) Chauncey Griffith, quoted by Edmund C. Arnold in *Functional Newspaper Design*. New York: Harper & Brothers, 1956.

(23) Related by Hans Ed. Meier, personal communication. The design philosophy of Syntax is analyzed by Erich Schulz-Anker, “Syntax-Antiqua, a Sans Serif on a New Basis”. *Gebrauchsgraphik* no. 8, 1970, pp. 49-56.

Syntax is a sans-serif based on proportions and letter forms of Renaissance humanist minuscule and classical Roman inscriptional letterforms. Released in 1968 under the name Syntax-Antiqua, it joined Edward Johnston’s London Underground lettering and Eric Gill’s Gill Sans as a “Humanist” sans-serif. In its narrow sense, the typographic term “Antiqua” means Humanist types of the Renaissance, also called “Garalde” (Garamond + Aldus) in a common type classification. In a broad sense, such as in the German DIN classification, Antiqua can mean nearly any style of seriffed typeface. The “Humanist sans-serif” has gained popularity since Syntax and has become an expanded genre within the sans-serif class.

Helvetica, designed by Max Miedinger, is a sans-serif typeface in the grotesque style cut in the mid-nineteenth century but refined in 1957 for modernist typography. Figure 11 shows the two typefaces for comparison.

(24) Blaise Pascal, Serie XXII, 512, in *Pensées*. Paris: Editions du Seuil, 1962.

(25) In this essay on typography, “texture” refers to the visual property of small sizes of text in which

Form, pattern & texture in the typographic image

the letter shapes are too small to be easily appreciated as forms on their own, but are nevertheless big enough to be recognized in normal reading. Different textures are perceptible aesthetic features of different typefaces.

Popular science accounts of the visual perception of texture include:

Bela Julesz, “Texture and Visual Perception”, *Scientific American*, vol. 212, no. 2, Feb. 1965, pp. 38–48; and “Experiments in the Visual Perception of Texture”, *Scientific American*, vol. 232, no. 4, Apr. 1975, pp. 34–43.

Some of Julesz’s claims have been disproven by Persi Diaconis and David Freedman, “On the Statistics of Vision: The Julesz Conjecture”. *Journal of Mathematical Psychology*, vol. 24, no. 2, 1981.

A more recent discussion and definition of texture, including its relation to reading:

Denis G. Pelli, Katherine A. Tillman, “The uncrowded window of object recognition”. *Nature Neuroscience*, vol. 11, no. 10, Oct. 2008, pp. 1129–1135.

The authors state:

We suggest that one might define “texture” as what one can see without object recognition.

If we cannot recognize things in this part of our vision [the periphery], what do we see? We see stuff (unnamed texture) and perceive space (the shape of the scene we are in). With an effort, observers can name and describe texture, but this rarely happens.

(26) Pierce (1980).

(27) Updike, op. cit.

(28) Franz Boas and Charles Cultee (narrator), *Chinook Texts*. Washington: Smithsonian Institution, Bureau of Ethnology, 1894.

Melville Jacobs and Victoria Howard (narrator), *Clackamas-Chinook Texts*. Bloomington: Indiana University Research Center in Anthropology, Folklore, and Linguistics, 1958.

Dell Hymes, “Victoria Howard’s ‘Gitskux and his Older Brother’: A Clackamas Chinook Myth”, in *Smoothing the Ground: Essays on Native American Oral Literature*. Berkeley, CA: University of California Press, 1983.

Acknowledgements

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I am grateful to the late Jack Stauffacher for bringing Jan Tschichold’s essay to my attention, to the late William Bright for discussions of the relation of typography to language, and especially to Kris Holmes for collaboration on the Lucida family of typefaces, which provided the opportunity to consider these matters in practice as well as theory.

I am also grateful to the late Sandra Kirshenbaum, founder, editor, and publisher of *Fine Print*, in which this article first appeared in print. It was my pleasure to serve as an associate editor for typography and as an occasional writer for *Fine Print* over several years.

◇ Charles Bigelow
<https://lucidafonts.com>

Postscript: A final bonus image, a cover of a special issue of the printing trade journal “typographische mitteilungen”, October 1925, designed by Jan Tschichold with sans-serif types. This definitive introduction to typographic modernism by its leading practitioner shows texture and pattern, while form is implied by the rectilinear structure of vertical and horizontal title words aligned with geometric rules. Compare with Figure 7, a title page in classical style designed by Tschichold 22 years later with seriffed types, also showing form and pattern.

