Fonts

A short introduction to font characteristics*

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Abstract

Almost anyone who develops an interest in fonts is bound to be overwhelmed by the bewildering variety of letterforms available. The number of fonts available from commercial suppliers like Adobe, URW, LinoType and others runs into the thousands. A recent catalog issued by FontShop (Truong et al., 1998) alone lists over 25 000 different varieties.[1] And somehow, although the differences of the individual letters are hardly noticable, each font has its own character, its own personality. Even the atmosphere elucidated by a text set from Adobe Garamond is noticably different from the atmosphere of the same text set from Stempel Garamond. Although decisions about the usage of fonts will always remain in the realm of esthetics, some knowledge about font characteristics may nevertheless help to create some order and to find out why certain design decisions just do not work. The main aim of this paper is to provide such background by describing the main aspects that might be used to describe a font.

The outline of the remainder of this paper is as follows. First I will discuss some basic font characteristics. Next some elementary, numerical dimensions along which properties of a typeface design can be assessed will be discussed. The next section elaborates on those measures and some additional aspects of 'contrast' will be discussed. The final two sections briefly present a font classification along the dimensions discussed in the previous section and some implications.

Some elementary differences

Proportional and monospaced. A first difference that can be recognized between typeface designs is the spacing of fonts. Monospaced or typewriter fonts in which each character occupies the same amount of space can be distinguished from proportionally spaced fonts.

Computer Modern typewriter (monospaced): Winmvw

Computer Modern Concrete (proportionally spaced): Winmvw

Hardly anyone will dispute the statement that proportionally spaced fonts are more beautiful and legible than monospaced designs. In a monospaced design the letter i takes as much space as a letter m or W. Consequently, some characters look simply too compressed, whereas around others too much white space is found. Monospaced fonts are simply not suited for body text. Only in situations where it is important that all characters are of equal width, e.g., in listings of computer programs, where it may be important that each individual character can be discerned and where the layout of the program may depend on using monospaced fonts, can the usage of a monospaced font be defended. In most other situations, they should simply be avoided.

Romans, italics, and slant. A second typeface characteristic that will hardly be new for any TEX-user is the difference between italic, oblique (slanted) and roman fonts. The difference between italic fonts and the roman fonts lies in their history. Italic fonts are the descendants of handwritten letter shapes, whereas the roman fonts were originally chiselled in stone. Consequently, the romans look more rigid; the italics, to the contrary, show more elegance and are more 'curvy'. Furthermore, the shapes of some individual characters differ; this difference is most apparent when we look at *a*, *g* and a, g (here in the italic and roman variant respectively). The origins of the italics being in handwriting, they are usually slanted, whereas the romans are typically typeset upright. This, however, is not strictly necessary. Italics can theoretically be typeset upright and romans may be slanted:

An upright *italic* and a *slanted or oblique italic*

An upright roman and a *slanted or oblique roman*

Generally designers agree that text set in roman is more legible than text set in italic, although the readability of italics accompanying different fonts may differ considerably, which is important if large pieces of text are typeset in italics. Compare for instance:

* Apart from some minor modifications, this article is identical to an earlier publication in MAPS, the communications of the Dutch TEX User Group, Nummer 22, Voorjaar 1999, pp. 81–93.

[1] This enormous variety is partially made possible by the introduction of electronic typefaces, which allows for worldwide distribution without exceptional cost. In 1950, that is before the advent of electronic typesetting, Groenendaal could still attempt to list *all* typefaces readily available to an ordinary typesetter.

A block of text set from Utopia Italics. Generally designers agree that text set in roman is more legible than text set in italic, although the readability of italics accompanying different fonts may differ considerably, which is important if large pieces of text are typeset in italics.

A block of text set from Computer Modern italics. Generally designers agree that text set in roman is more legible than text set in italic, although the readability of italics accompanying different fonts may differ considerably, which is important if large pieces of text are typeset in italics.

If multiple slanted fonts are used in one piece of running text, it is important to ensure that the angle of slant is comparable, otherwise a page will look rather uneven.

Serif and sans serif. An issue that raised much discussion in the first half of this century (see e.g., Tschichold, 1991) but on which a *communis opinio* now seems to have been reached is the usage of serifed or sans serif fonts:

Computer Modern (with serifs)

Computer Modern sans (sans serif)

Whereas at the beginning of this century a large group of designers were of the opinion that sans serif designs were to be preferred as they were more modern, emphasizing the pure shape of the individual characters and omitting superfluous elements, it is now generally recognized that the serifs have an important function for the following, not always independent, aspects of legibility:

- Serifs make individual characters more distinct. In their sans serif variant many characters look remarkably, if not exactly, like mirror images of each other. During the reading process they are easily confused, especially by persons suffering from dyslexia. The advantage of serifed typefaces over their non-serif counterparts, in this respect, is easily seen from the following example:

  b d b d
  p q p q

- Serifs emphasize the beginning and ending of individual characters, compare e.g., rn with rn.
- Serifs emphasize the shape of words. It is generally recognized that experienced readers do not read individual characters, but read words and mainly use the upper half of a line of text for this purpose. The general claim is that the serifs facilitate this process. Just check it for yourself by looking at the next set of lines:

Now you miss the upper half of this line

This is a text: quer auer galapagos

This is a text: quer auer galapagos

Furthermore, serifs have an important function in shaping the personality of a type design. Different serifs — a set of possible serifs is presented in Figure 1 — give a typeface design a clearly distinct personality.

The first serif actually is no serif at all. The second one, the slab serif, is orthogonal to the stem to which it is attached and has about the same width as this stem. Slab serifs are generally, but not necessarily (Lucida Typewriter is a well-known example), used for monospaced fonts like Courier and Computer Modern Typewriter. Some proportionally-spaced fonts, like the Computer Modern Concrete we encountered earlier in this paper, also have slab serifs. Those fonts are generally called Egyptiennes and are normally used for two purposes: display text in advertising, and typesetting labels on maps. A well known example is 'Atlas', by the Amsterdam Typefoundry (see Figure 2). An important reason for using slab serifs in this latter type of copy may well be that the serifs clearly belong to the letters and consequently are not likely to be confused with other elements on the map.[2]

The next type of serif, the wedge serif, has been popular in advertising and for book covers during the fifties and sixties of this century, but is hardly used nowadays. The main, and probably only, advantage of this design is that is is easily drawn by hand and still looks somewhat unusual.

The hairline or modern serif is typical of 'modern' typefaces like Didot or Bodoni (see Figure 3). Such serifs became popular in the second half of the eighteenth century. Great craftmanship was required to make the matrices needed to cast letters with those extremely thin serifs. Furthermore, great care had to be taken during printing, as the hairline serifs were very fragile and could easily break.

[2] A second reason for the preference for Egyptiennes and sans serif fonts in applications like map printing is that the contrast of those fonts typically is near unity; see the discussion on contrast later in this paper.

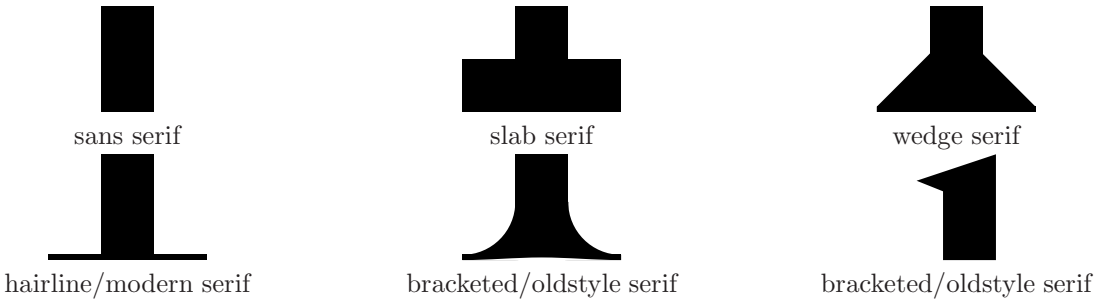

Figure 1: Different types of serifs.

Figure 2: Font specimen of 'Atlas' (source: N.V. Lettergieterj Amsterdam [Undated]).

Nowadays, one sometimes wonders whether those designs are the equivalent of Paganini's capriccios for violin, if their main purpose is not to show craftsmanship rather than beauty? Nevertheless, one has to admit that a book in Bodoni, carefully typeset on the right kind of paper, still looks stunning (apart from blackletter, Bodoni is one of the very few typefaces that looks good in combination with high contrast illustrations like woodcuts Groenendaal, 1950).

The serif we encounter most often is the bracketed or oldstyle serif (both the lower and upper serif are shown in Figure 1). This is the traditional serif, found in fonts like Garamond, Bembo and Times.[3]

The dimensions of a typeface design

Size and design size. The best known, and probably least useful, dimension of a font is its 'size'. Everyone has encountered remarks like 'this text is set from a 10-point Bembo' and 'papers should be submitted in 12-point Times Roman'. Traditionally the size of a font is the height of the piece of lead from which the text is set. Nowadays the size of a font can generally be considered an almost useless figure. In most fonts it is equal to the height of the parentheses ('()'), but even that is not always the case. In wordprocessors, the point size will generally be equal to the distance between lines of text if you set linespacing to one. For practical purposes this knowledge is limited; the only thing about font size that is important is that most fonts have a design size. This is the size at which the font will look best. Although bu using modern typesetting software like TEX, or any Windows or Macintosh program, it is possible to scale a font to any desired size, you will generally get better results if you stick to a size in the neighbourhood of the design size. For some popular fonts, like Times Roman or our good old Computer Modern, different design sizes even are available. This allows the careful designer to use all fonts at their optimal sizes. When using Computer Modern, the standard LATEX document classes even take care of this automatically: the footnotes, for instance, are set from a font with another design size than the font used for the main text. This ensures an equal level of 'grayness' across the page and increases legibility (characters of fonts with a smaller design size are generally somewhat wider and heavier); look for instance at the difference between the next two examples:

[3] Times is somewhat peculiar in this respect: the bold characters use modern serifs, the ordinary roman, oldstyle serifs.

Computer Modern with 5-point design size

Computer Modern with 17-point design size

The x-height. For practical purposes, a more important characteristic is the x-height of a font, which is exactly what the name implies: the height of an x (or any other letter without ascenders or descenders) in the given font.[4] The x-height of a font essentially determines the size of the font as it will be perceived by the reader.Fonts with an identical nominal size may have x-heights that differ surprisingly. The next two examples show Utopia and Garamond at the same size. The x-heights, and consequently the perceived size of the font, however, differ considerably:

Hamburgefont Hamburgefont

When combining fonts in running text, for instance when using typewriter or sans serif fonts in combination with an ordinary serifed roman, it is important to ensure that the x-heights of all fonts used are identical. A traditional problematic combination consists of the standard PostScript fonts Times, Helvetica and Courier. Those fonts have quite different x-heights, which distorts the evenness of a page if no measures are taken:[5]

Times Helvetica Courier

Fortunately, the New Font Selection Scheme (a short introduction to the NFSS can be found in Kroonenberg, 1999) makes solving this problem rather easy: the default is to load each font at the same size; however, it is also possible to specify a scale factor in addition, which may be used to compensate for different x-heights.

Ascenders, descenders and capitals. In addition to the x-height and font size, three other height-related dimensions of a font are available: the height of the capitals (e.g., K, H, and S), the height of the ascenders (e.g., k, l, and h), and the length of the descenders (e.g., j, g, and y). In many fonts the capital-height is equal to the height of the ascenders; sometimes, however, the ascenders are slightly longer than the capitals. The main advantage of making the capitals slightly shorter than the ascenders is that this gives a more even level of grayness across the page; otherwise — especially when the ascenders are large relative to x-height — the capitals would stand out too much.[6] An example of a font that uses slightly smaller capitals than ascenders is Garamond:

HhKkLlAk

The combination of x-height and ascender and descender heights roughly determines how economical a typeface is,[7] in other words: how much text can be put on a page without sacrificing legibility. Fonts with relatively large x-heights compared to their size can be used at small sizes. Consequently, they are rather economical: more lines of text can be put on a single page and more text will fit on a single line. However, the gain is not as large as one might hope for: fonts with relatively large x-height generally require some additional interline spacing.

Width and stem width. Apart from the measures of font height, discussed in the previous paragraphs, we also need some measure of font width. TEX provides the user with an amount called em-space, the width of a single m, which for design considerations has relatively little importance. Somewhat more important is the average width of a font, generally measured (Rubenstein, 1988) by the total width of all lowercase characters. This width is also of importance when combining fonts. Although less perceptible than the x-height, fonts with different widths (given an identical height) tend to combine badly (this problem is mainly related to the 'rhythm' of the font, to be discussed later in this paper).[8] Of course width also is related to the amount of text that can be put on a page; the larger the width the smaller the number of characters that fit on a single line. Not surprisingly, fonts with an x-height that is relatively large tend to have a large width as well, thus reducing the economy gained by using such a font.

A final directly measurable characteristic of a font is stem width: the width of the stems of letters like l. Of course this also influences the results when combining different fonts in a piece of text. The next example shows two monospaced fonts, along

[4] The x-height of a font is readily available in TEX. If you want to specify a length in terms of the x-height of the current font, just use the measure ex, instead of a more traditional measure like cm or pt.

[5] The example also shows that color and rhythm of the three typefaces differ.

[6] Barbara Beeton drew my attention to the fact that this is especially important when typesetting text in German, where every noun is capitalized.

[7] Morison (1997) even claims that the general principle behind the evolution of font design is economy, and indeed more recently developed typefaces tend to be more economical than traditional ones.

[8] Unfortunately TEX is only able to scale the height and width of a font simultaneously, so this problem is not easily solved. Future generations of TEX may well solve this problem.

with a Times. With regard to stem width (and consequently blackness) Computer Modern typewriter combines far better with Times than the traditional Courier (but of course, the x-height still needs some adjustment).

Courier Times Computer Modern Typewriter

Some more complex dimensions

Color. Although it is impossible to characterize a font completely by a set of numbers, we may refine the measurements presented till now to get some additional insight into the properties of a design. Most TEX-users, for instance, will have heard the remark that Computer Modern is 'too light'. This somewhat subjective criticism can be made more objective by calculating a measure of 'color'. This measure is defined as the ratio of the width of the set of all 26 lowercase letters, divided by the stem width (Rubenstein, 1988). In other words, color is a measure of the amount of paper left white: the higher the color-value of a font is, the lighter it looks. Color values for a number of popular fonts are provided in Table 1. It is evident that Times, which is the font of reference for most people, is much darker than the Computer Modern fonts. What also is noteworthy is that the 12-point Computer Modern is somewhat lighter that the 10-point variant. Finally, one may notice that, notwithstanding the common criticism that Computer Modern is 'too light', it is not the lightest font in the small set presented here: Garamond is even lighter. Apparently, color is not all there is to say. When we look at the other measures provided in this table, it seems as if Garamond is able to compensate for an apparent lack of color by a high contrast value.

	color	*contrast*	*weight*
cmr12	197.111	1.703	0.146
cmr10	192.258	1.650	0.153
Times	156	2	0.17
Garamond	208	3	0.15
Helvetica	163	1	0.16
Bembo	184	2	0.16
Van Dijck	191	2.75	0.15

Table 1: Color, weight and contrast of some popular fonts (the statistics for Times, Garamond, Helvetica, Bembo and Van Dijck are based on measurements presented in Rubenstein (1988); the statistics for both Computer Modern variants were kindly provided by Taco Hoekwater).

Contrast. Contrast is defined as the ratio between the width of vertical and horizontal stems (Rubenstein, 1988). Contrast is, roughly speaking, what makes a font lively, brilliant if you wish. If contrast gets extremely high, a font is hardly legible at all and only suited for use as a display typeface in, for instance, advertising. Similarly, fonts with extremely low contrast are hardly legible. Endless discussions about optimal contrast values are, of course, possible, but there seems to be some general agreement that for, serifed typefaces, contrast should be somewhere between 2 and 3.5. It is evident from the data presented in Table 1 that Computer Modern scores rather low on the contrast (of if you wish, high in the 'dullness') dimension. The design simply lacks contrast to an extent that may impel legibility. The cautious reader may also have noticed the extremely low contrast value of Helvetica. Such contrast values are rather typical for sans serif typefaces, which tend to stress evenness, often at the cost of legibility.

There is another aspect of contrast that deserves attention: contrast also is an indication of the 'fragility' of a font. At low resolutions (or looked at from large distances) designs with high contrast may be seriously distorted. This is one of the main reasons why sans serifed typefaces (and typewriter and slab serif fonts, which also tend to have contrast values near one) are the fonts of choice for transparencies, traffic signs and computer displays.

Theoretically, contrast values between zero and one are also possible. Such extreme designs, however, are only suited for advertising and other more-or-less artistic utterances.

Weight. A final, common dimension of a font is its weight. Color measures the darkness of a font as it appears to the reader who looks at a page of text. Weight is used to assess the darkness of the individual letters and it calculated by dividing the vertical stem width by the x-height of the font. According to Rubenstein (1988) if weight lies outside the range 0.15–0.2, legibility suffers. Apart from the 12-point Computer Modern all fonts presented in Table 1 are within this range. Times is the most 'weighty' design in the set of fonts presented here, but the differences are less noteworthy than on the previous dimensions.

Additional aspects of contrast

Contrast is one of the more important aspects of a type design. However, the measure of contrast presented above does not cover this aspect completely. A first additional aspect of contrast is the axis of

Figure 3: Font specimen of ‘Bodoni’ (source: Klein et al., 1991).

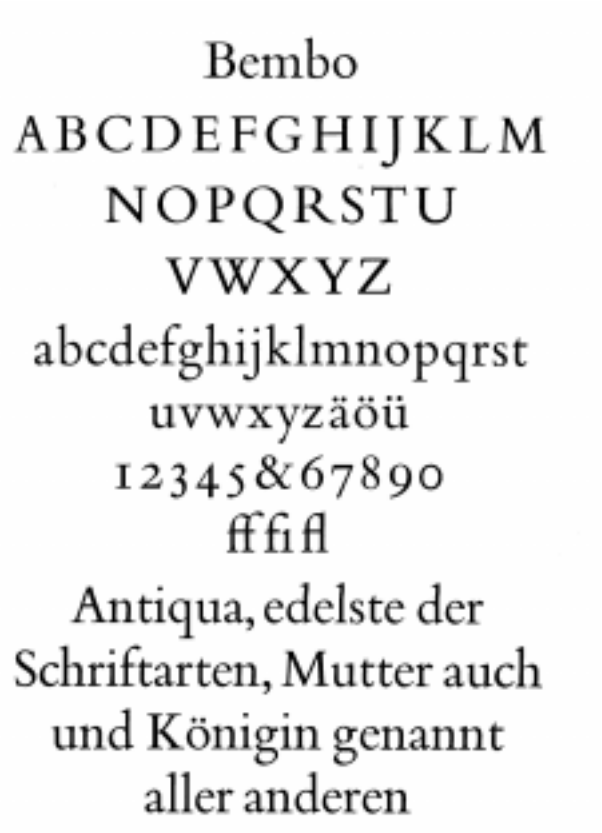

Figure 4: Font specimen of ‘Bembo’ (source: Tschichold, 1992).

contrast, or the angle at which the broader parts of the characters appear. If we compare, for instance, the design of Bodoni (see Figure 3) with Bembo (see Figure 4), it is not only clear that contrast of Bodoni is higher than that of Bembo, but also that the axis of contrast differs. This is most easily seen, by comparing the ‘o’ or the ‘e’ of both fonts. In Bodoni, contrast is orthogonal to the baseline, whereas in Bembo, it is slanted to the left.[9] The axis of contrast has little influence on legibility of a typeface, although the axis of contrast is related to contrast and hence influences legibility indirectly.[10]

The second additional aspect of contrast, frequency, is a far more important determinant of legibility. Figure 5 show the sensitivity of the human eye as a function of frequency. Sensitivity is, roughly, defined as the ease with which for instance *individual* lines, drawn on a sheet of paper can be distinguished. If the lines are very far apart, that is frequency is low, the human eye is simply not able to focus on both lines simultaneously and sensitivity is low. If the lines are very close to each other, frequency is high, the human eye does not distinguish individual lines any more. Although a page may contain black and white lines, it is perceived as being gray.[11] The ability of the human eye to perceive individual lines, rather than no lines at all, or some level of gray, is at a maximum somewhere between 6 and 11 cycles per degree. Of course, in order for a typeface design to be legible, it is highly desirable that the individual strokes of the characters are easily discernible. Unfortunately let-

[9] If one mentally imagines the ‘o’ begin drawn on paper with a broad brush or pencil, the brush would be held horizontally when drawing the Bodoni ‘o’, and at a 30° angle when drawing the Bembo ‘o’.

[10] To maximize contrast, the horizontal parts have to be as thin as possible and this can only be accomplished using a ‘horizontal brush’.

[11] Frequency is not defined in terms of lines per inch but in terms of lines per degree of visual angle. If the sheet of paper is closer to our eyes, the number of lines per degree of visual angle diminishes, although the number of lines per inch remains the same. In this way the individual lines that look like uniform gray at reading distance, become distinguishable at closer examination. At a reading distance of about 40 centimeters, frequency in lines per inch is about two times as high as frequency in lines per degree of visual angle.

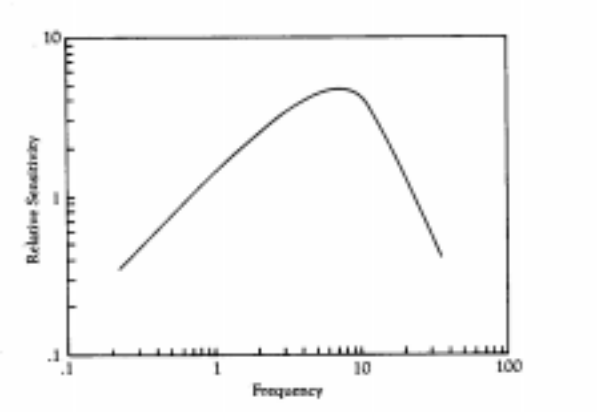

Figure 5: Sensitivity of the human eye as a function of frequency (in cycles per degree of visual angle) (source: Rubenstein, 1988).

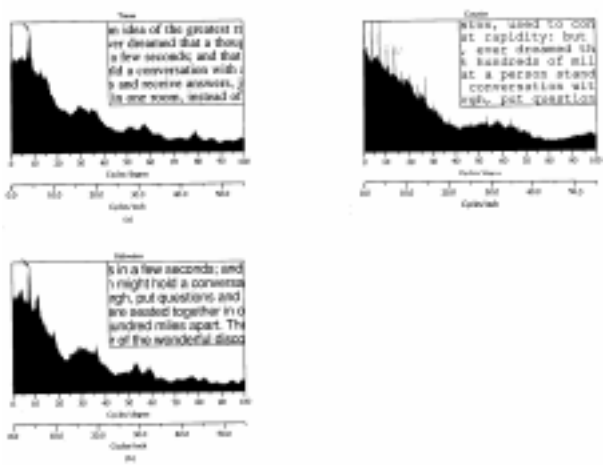

Figure 6: Results (power spectra) of Fourier analysis on text samples in three popular typefaces (source: Rubenstein, 1988).

ters do not consist of simple lines but are slightly more complex: a single number will not suffice to describe the frequency of a font. A number of frequencies will be present on a single page. Fortunately, using Fourier analysis it is possible to find those frequencies and make a plot of them, as is done in Figure 6 for three popular typeface designs: Times, Helvetica and Courier. Now we can look for a dominant frequency which hopefully lies some where between 6 and 11 cycles per degree. The results confirm our expectations: both Helvetica and Times show a clearly distinguishable peak in their frequency distribution at about the point of maximum discernability to the human eye. Helvetica, however, shows a second peak, which will make the design less readible. Courier, finally shows at least four peaks in its frequency distribution.

From characteristics to classification

The characteristics mentioned in the previous section provide the clues that can be used to build a classification of typefaces. The traditional classification scheme distinguishes four categories of serifed typefaces: Venetian, oldstyle, transitional and modern. Venetian typefaces have been in use since about 1470. They are hardly distinguishable from oldstyle typefaces, which have been in use since about 1500. Both categories of fonts share a slanted axis of contrast and the usage of, not surprisingly, oldstyle serifs. Capitals, typically, are somewhat smaller than the ascenders, they end where the serifs of ascenders start. One reason for this is that the ascenders and descenders of those fonts are relatively long and their x-height is relatively small. Furthermore, those fonts are typically relatively light, and contrast is not extreme. To distinguish a Venetian font from an oldstyle font, two features are of importance: first, oldstyle fonts usually have a horizontal crossbar of the lowercase e, whereas this crossbar in a Venetian is at an angle of about 20° with the baseline (like in the 'Heineken' logo). Furthermore, the oldstyle capital M has the usual serifs, whereas the Venetian M has double serifs. Prime examples of oldstyle fonts are Garamond, Baskerville and Caslon. Popular Venetians are Cloister, Centaur and many of the designs by Goudy.

The first transitional font was the 'Romain du Roi Louis XVI' designed for French governmental publications in about 1702, but only came into general usage at about 1755. Although the serifs of those fonts are already horizontal, the contrast axis is not yet orthogonal to the baseline, but more upright than in the Venetian or oldstyle typefaces. It is generally claimed (Morison, 1997) that the ascenders are as high as the capitals in those transitional fonts, however, upon my examination of some font specimens I learned that this rule is not universally valid. Similarly, although the transitional fonts are supposed to have lining numbers instead of oldstyle numbers,[12] this also is not always the case.

[12] Lining numbers all have the same height and do not have ascenders and descenders. Oldstyle numbers, on the contrary, differ in size and some numbers (e.g., 9) have descenders, whereas others (e.g., 6) have ascenders. Another important dimension along which numbers may vary is whether they are fixed-width or not. This latter aspect is of course important for their applicability in tabular material. Thanks to Barabara Beeton for making this additional comment.

The transitionals are generally blacker than oldstyle fonts; they look stronger, but less elegant.

Finally the moderns, of which Bodoni and Didot are the prime examples, can be found from 1790 on. The development of those typefaces continues the development started with the transitional fonts. The x-height slightly increases and the capitals are as high as (and sometimes even slightly higher than) the ascenders. The axis of contrast now is completely vertical and the serifs are horizontal. Contrast often is extreme, a page set from Bodoni looks brilliant. Although the page may look particularly well from a distance, legibility may suffer from this extreme contrast. Other moderns, like Egmont and Walbaum, are less extreme in this respect and consequently more legible. Table numbers are the rule, but exceptions may still occur.

Some implications

Typefaces, of course, neither were nor are designed with the classification or the numerous characteristics mentioned above in mind. The classification is not perfect, in particular, recently-developed fonts are difficult to classify. As a taxonomy, the classification scheme is useless, it merely functions as a starting point in determining the characteristics of a typeface, and the way it may be used. Typography remains an art, not a science, and each rule has its exception, but some rules of thumb may nevertheless help.

In the previous sections numerous aspects of font selection have already been mentioned. Monospaced fonts are generally not the best choice. Only for typesetting computer programs and similar applications, may they be the preferred kind of typeface. For applications like traffic signs, transparencies, computer applications and other messages that have to be read at low resolution or from a large distance, typefaces with low contrast, particularly sans serif and slab serif typefaces are generally preferred.

For typesetting large amounts of text, e.g., in a journal or a book, serifed typefaces are generally the best choice. If the result has to be striking, modern typefaces are preferred. They may draw attention to a magazine the consumer otherwise wouldn't buy or to a feature article that otherwise might be skipped by most readers. Modern typefaces may also be the font of choice because they blend well with illustrations or emphasize the 'designer-like' atmosphere of a book. Art books are a typical example.[13]

If it may be assumed beforehand that a text will be read, for instance in the case of a novel, oldstyle and transitional designs are preferred. Legibility of those designs is better than that of any other font category. Economy may be one of the criteria for font selection: with transitionals, generally more text can be put on a given amount of paper than with the oldstyle fonts. Oldstyle fonts, on the other hand may be slightly more legible and, more importantly: they look more elegant. Selection of a particular typeface may also be guided by other considerations: Caslon is a fairly appropriate choice for a text by Spinoza; for a French novel from the early 19th century a Didot may be the right choice, just because of the contemporary atmosphere elucidated by such a design.

After a certain typeface has been selected, some general guidelines may be drawn knowing its place in the classification scheme. Again, those guidelines are not laws, but mainly "rules of thumb". With Venetians and oldstyles the œ and æ ligatures may be used, and usage of the fi, fl, and fli ligatures is almost required. When using a modern or transitional, the f-based ligatures can be omitted, and usage of the other ligatures generally looks kind of overdone.

Font selection for the body text also has some implications for other design decisions. One of the charms of oldstyle fonts is that they look so quiet. To maintain this feature, chapter and section headers may be typeset from an ordinary roman or from small capitals rather than the more commonly encountered boldface variant. In some cases, depending on how similar to the roman font this variant is, an italic may also work. Combined with modern faces, however, a design in which only ordinary roman and small capitals are used looks just too withdrawn. The timidity of such a design just does not mix with the aggressiveness of a modern font.

A final remark may be made about the combination of different typefaces in a single design. Generally speaking it is required that both typefaces are clearly distinct. Furthermore it most often works best when the typeface used for headers and other sparingly used features is blacker than the font used for body text. Thus a Helvetica for section headings with a body text of Times may work well. Bembo for headings with Garamond for the body text (or vice versa) will just be plain ugly. Bodoni for the headings with a body of Garamond may work (if

[13] The majority of the applications in which modern typefaces can be used share another characteristic: they are typically printed on glossy paper which not only combines well with the atmosphere of, e.g., a Bodoni, but also is a prerequisite for adequate printing of the extremely thin hairlines of this typeface.

used with care); Garamond for the headings with Bodoni for the body will probably be ugly, etc. One may feel tempted to deduce the general rule that when combining two typefaces, the least legible one is most suited for headings.

Of course, the rules mentioned above have their exceptions. The only way to find out what works is to experiment. The guidelines given may just help to reduce the number of options to be investigated and to explain afterwards what did and didn't work. And this feature, combined with an urge to communicate the joy that playing around with fonts gives me, was the main aim I had with this article. To anyone who wishes to pursue the topics touched upon in this paper in more depth, I can recommend reading Tschichold's treasury of art and lettering. For those interested in technical details, Rubenstein's monograph is a valuable source book.

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