

# Digital typography

This document was downloaded from keitham.net. Copyright © Keith Tam 2003–19. All rights reserved. No part of this document may be reproduced without the author's prior written permission. keith@keitham.net

Since the advent of printing with movable type, typography and technology have become inseparable. If we are to accept the definition of typography as the mechanical production of written language, then we must have an intimate understanding of our prevailing typesetting technology – the computer and its software and output devices – in order to become competent typographic designers. There is craftsmanship involved in digital typesetting; creativity is also built upon the foundation of understanding the technology.

## Key concepts

### The desktop publishing revolution

The desktop publishing revolution that transformed the graphic design industry began in 1985. Three companies were responsible: Apple, Adobe and Aldus. PostScript is a device-independent page description language invented by Adobe. Along with Aldus PageMaker, the first desktop publishing application and Apple's first affordable 300-dpi laser printer, the LaserWriter, all running on an Apple Macintosh, the PostScript language made professional typesetting from the desktop a reality.

### Typefaces and fonts

A digital font, in short, is a piece of computer software that contains a collection of vector drawings along with spacing, kerning and other data that could be accessed through the keyboard. Of course, these drawings are often letters which, when combined sensibly, form meaningful words.

A family of typefaces consists of a number of variant fonts that share a common design. A standard typeface such as Times Roman may consist of a regular, and italic, a bold and a bold italic; more extensive families may consist of a number of weights and widths with respective italics, small caps, optical sizes and so on. Display or dingbat typefaces may simply be single fonts.

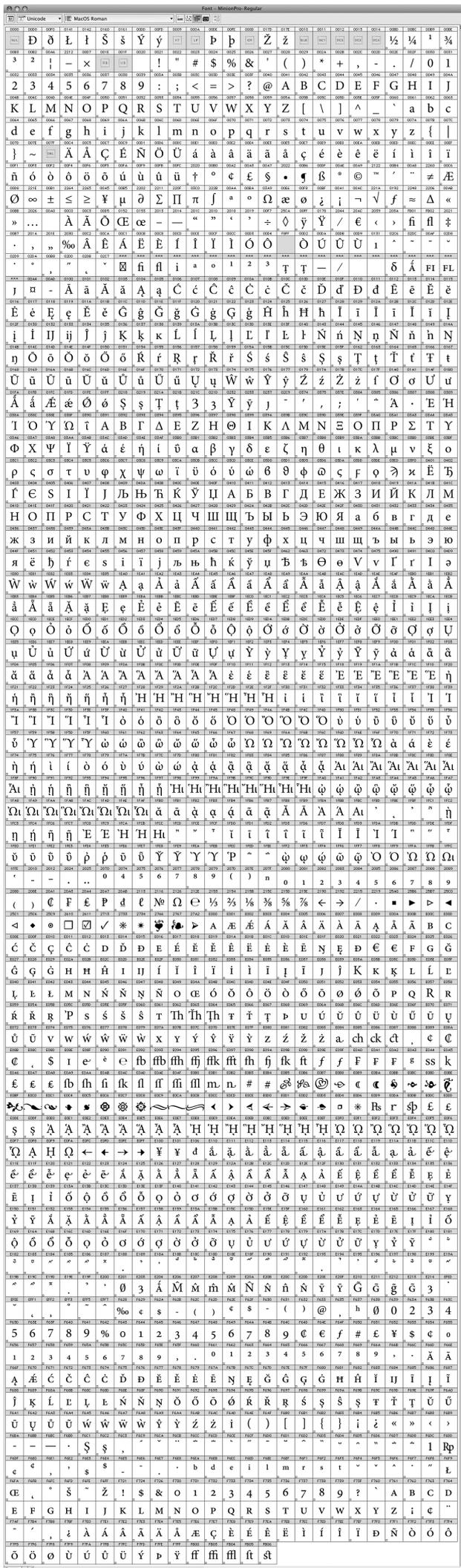
### Character and glyph

A character is the smallest semantic unit of a language. Or simply put, a sign in a given language. For example a lowercase e, an uppercase A or a figure 8. A glyph, on the other hand, is the specific form that characters take in a specific font – or the visual forms that represent a single letter. There can be more than one glyph representing a single character. For example the letter e can take the form of a swash e, an ordinal (raised) e, or a small capital E. These are different variations of the same letter.

With the limited character /glyph set of a typical PostScript Type 1 font, one character is often assigned to only one glyph. Alternate glyphs have to be accessed via separate fonts. With the introduction of OpenType fonts, one character can be mapped onto many different glyphs, allowing the representation (visual form) of a character to be independent from the linguistic value of a character.

### Making fonts

Fonts are made using font creation software programs such as Fontographer, FontLab or Glyphs. These font creation programs provide drawing tools, spacing and kerning features, scripting capabilities and OpenType building tools. The designs can be exported as Type 1, TrueType and OpenType fonts.



Who said the alphabet has only 26 letters? This font, Minion Pro, designed by Robert Slimbach and released by Adobe in 2000, contains a total of 1,677 glyphs (characters and their variant forms). These glyphs include the basic upper- and lowercase forms of the latin alphabet, accented letters for typesetting over 200 languages that use the extended Latin character set, Greek and Cyrillic letters, six sets of numerals, small capital letters, ligatures, ornaments, plus punctuation marks, mathematical symbols and other typographic variants.

### Font licensing and copyright

Most fonts can now be licensed online and downloaded instantly any time via websites of font vendors or type foundries. When you purchase a font, you are acquiring a license from the designer (or type foundry) for the right to use it. It is essentially the same as buying software. A font license agreement (EULA) would generally state the number of computers or printers you are allowed to use the font on at one physical location. Some EULAs do not allow you to pass the font to a third party for, say production purposes; that third party would have to also purchase a license for the font. Be sure to read the EULA carefully. It is illegal to borrow fonts from others or lend fonts to others. Type design is a dying art. The amount of work invested into a typeface could be years, or even decades; and yet the economic return is hopelessly minimal. Always support fellow designers and use fonts responsibly and ethically.

### Font formats

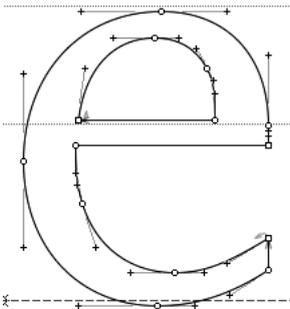
#### PostScript Type 1

PostScript Type 1 was the most commonly used font format amongst graphic design professionals for many years. Adobe Systems first introduced it to the Macintosh platform in 1985. PostScript is a page description language that processes and transfer scalable, vector-based graphics and type from the computer onto a printed page, independent of what device is being used. The quality is only bound by the resolution of the printer used. Unlike older computer fonts that were based on fixed-size bitmap images, PostScript font outlines are described as smooth curves using mathematical formulas.

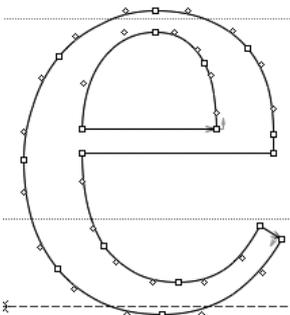
Although Type 1 format has over 20 years of history in the graphic arts, the format has many shortcomings. Type 1 fonts need two files to function properly: a bitmap font file plus a PostScript (printer) font file. Without either of these, the font will not function properly. Also, Type 1 fonts only allow a maximum of 256 glyphs in a font, a serious limitation for non-Latin fonts with extremely large character sets. When advanced typographic variants, such as small caps, additional ligatures, fractions, etc. are needed, additional fonts called 'expert sets' are required. Type 1 fonts are gradually becoming obsolete.

#### TrueType

TrueType is a font that was jointly developed by Apple and Microsoft as a rival to the widely adopted PostScript Type 1 format in the late 1980s. TrueType fonts are also scalable, vector-based fonts, but instead of using cubic (bézier) curves as in Type 1 fonts, TrueType fonts uses quadratic curves to describe their outlines. Unlike PostScript Type 1 fonts, TrueType fonts only need a single suitcase file to function properly. Graphic design professionals often look down on TrueType fonts as 'amateur'. This is partly attributed to the fact that all of the default MacOS and Windows system fonts are in TrueType format, and few TrueType fonts come with advanced typographic variants such as expert sets. Also, in earlier days, TrueType fonts did have incompatibility problems with the industry standard page description language PostScript, but these problems don't seem to exist any more. TrueType fonts tend to function the best in office-type applications, such as Pages, Word, PowerPoint and Excel, and are generally the preferred font format for general office use.



A glyph drawing in PostScript Type 1 format, using bézier (cubic) curves.



A glyph drawing in TrueType format, using quadratic curves. Note that it has more control points than the PostScript counterpart.

One of the great advantages of TrueType fonts is their sophisticated hinting capability, which ensure clean, crisp and highly legible bitmap display for on-screen use. Matthew Carter's Verdana and Georgia are prime examples of expertly hinted fonts. These should always be specified for web pages.

Although TrueType fonts technically perform as well as other formats, it might still be best to avoid them for print use. It is definitely advisable to avoid (system) TrueType fonts such as Arial or Verdana in order to distinguish our work from that of amateurs!

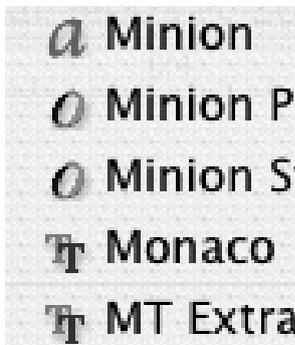
### OpenType

OpenType is a new font format that is increasingly adopted by both graphic design professionals and general users. OpenType was jointly developed by Adobe and Microsoft in the 1990s to unite and standardise the Type 1 and TrueType formats by functioning as a 'wrapper' for Type 1 and TrueType fonts. One of the main advantages of OpenType is cross-platform compatibility – a single OpenType font can be used in both Windows and MacOS platforms, licensing permitting. Through the use of Unicode encoding, an OpenType font can have as many as 65,000 characters in a single font file. This is large enough for every conceivable language in the world, including Chinese. The large character set also allows sophisticated typographic features to be accessed from a single font file, for example small caps, different types of figures, ligatures, without having to use additional font files.

Adobe's 'Pro' fonts have huge character sets that include advanced typographic features such small caps, swash characters, alternate characters, ligatures, ordinal numbers and letters, fractions, ornaments, as well as Greek and Cyrillic characters, all contained in a single font file. These advanced features are fully supported and accessible in most Adobe applications. Some programs, for example Microsoft Word, might allow you to use OpenType fonts but only grant you access to the first 256 characters, so none of the advanced features may be used.

### Font management

Fonts are usually stored in various locations within the computer operating system folder. In MacOS for instance, they might be stored at several confusing locations. The best way to organise them (when you have amassed a sizable library) is to use a font management program such, Suitcase, Linotype FontExplorer or FontBook (which comes with MacOS) These programs allow you to organise fonts into folders and activate and deactivate them when necessary. Fonts can also be automatically loaded as documents are opened.



In the InDesign font menu, font formats are denoted by an icon next to the font name. The 'a' denotes PostScript Type 1, 'TT' for TrueType and 'O' for OpenType.

## Detail typography

### Advanced professional typography

In a 'standard' font, for example the system font Palatino, only four font variants are included: a regular, an italic, a bold and a bold italic. These are often inadequate for professional use. Fonts for professionals are often available as large families consisting of many weights (light, regular, bold, semibold, heavy, black) and widths (condensed and expanded). Advanced typographic features are often included in OpenType fonts with extra glyphs and built-in features, which could be accessed by choosing menu commands in Adobe InDesign, Illustrator or even Photoshop.

### Small caps

Small caps are not merely scaled down versions of the standard capital letters. True small caps are drawn to optically match the weight of lowercase letters. They are often slightly wider than regular caps and are designed to be used together. Standard capitals, on the other hand, are often (not always) designed to be used together with lowercase letters but not each other.

Lyon Text fake SMALLCAPS for comparison

Lyon Text true SMALLCAPS for comparison

### Figures

'Modern' or lining figures (1234567890) share the same visual weight as capital letters and line up neatly in columns. They are usually provided as the standard figure set in most fonts. Old style or non-lining figures (1234567890) are figures with ascenders and descenders that work more harmoniously with lowercase letters in continuous text. Most fonts have lining figures as standard. Some OpenType Pro fonts include four sets of figures as shown below, accessed through the 'OpenType' menu command. Figures might also come as superiors or inferiors (<sup>1234567890</sup><sub>1234567890</sub>), useful for footnote references or fractions.

**Lining figures** are similar to capital letters, and line up neatly in columns because their widths are the same.

0123456789  
1317462980

**Proportional oldstyle figures** are similar to lowercase letters, with ascenders and descenders. They do not line up in columns.

0123456789  
1317462980

**Proportional lining figures** are similar to capital letters, but do not line up in columns because their widths are different.

0123456789  
1317462981

**Tabular oldstyle figures** are oldstyle figures with ascenders and descenders, but also line up in columns as their widths are the same.

0123456789  
1317462981

### Fractions

Some Expert or Pro fonts come with sets of optically adjusted fractions or allow you to build your own. Fractions require similar optical adjustments to small caps. A solidus (/) should be used, not a virgule ( / ), the standard slash.

9<sup>8</sup>/<sub>100</sub> not 98/100      1<sup>3</sup>/<sub>4</sub> not 1-3/4

### Alternates and swash characters

These are special characters that are might be just a bit different from the usual character set, archaic or more exuberant. Swash characters are sometimes provided for italic fonts. Here are the swash characters in Minion Pro:

*R A M T e a m r*

### Ligatures

Ligatures are two or more letters that are combined as one glyph. The ampersand is the most common ligature (*et*, Latin for ‘and’), and fi and fl ligatures are provided as standard for most fonts. Sometimes ffi and ffl are provided. Other unusual ligatures might be provided simply for visual pleasure, such as Zuzana Lick’s Mrs Eaves. Others might be archaic, such as çt st fh fi fl etc. (f= long ‘s’ used in old texts) provided for some typefaces such as Adobe Caslon Pro.

ffi ffi fj ffj çt st fh fi fl ff ft

### Optical sizes

In the days of metal type, fonts were cut size for size. Each size was designed according to their contexts of use. With digital type, a font is no longer tied to any particular size. Types that are designed to appear in small sizes have rather different functional and aesthetic requirements than those that are used for display purposes, at large sizes. For example, type for small sizes need to generally be more robust, wider in proportion and lower in contrast in order to not appear weak. If the same font were used for large sizes, it would look cumbersome and unwieldy. Some typeface families are size-sensitive and may consist of font variants for a range of sizes. The 72pt variant would have crisper serifs, higher contrast, more condensed widths and tighter spacing; whereas the 8pt variant would have chunkier serifs, lower contrast, wider characters and looser spacing. Some of Adobe’s Pro OpenType optical typefaces have font variants named ‘caption’, ‘regular’, ‘subhead’ and ‘display’.

**63** Compare Baskerville Oldstyle (top, for large size display type) and Berthold Baskerville (bottom, for small continuous text).

O Hamburg  
O Hamburg

**64** Different optical sizes of Adobe Minion Pro, designed for different purposes and sizes.

Minion Pro Caption  
Minion Pro Regular  
Minion Pro Subhead  
Minion Pro Display

Hyphen, en dash and em dash



*Faux 'italic' type*  
*True italic type*

**Faux bold**  
**True bold**

**Univers Bold**  
**80% digitally**  
**condensed**

**Univers Bold**  
**Condensed**  
**typeface**

## General working practice

- 1 Never type two spaces after full stops of other punctuation. This was necessary for typewriter fonts that were monospaced, but redundant for proportional-spaced fonts. If you need bigger spaces, use the em or en spaces (or tabs); if you need smaller spaces, use thin or hair spaces. These can be accessed through the **Type > Insert White Space** menu command in InDesign (see page 11).
- 2 Do not hit return twice between paragraphs. Spaces between paragraphs can be finely adjusted via paragraph settings, by inputting 'space before' and 'space after' values (see page 30). If you need to force a line break, use **shift + return**. Never use multiple returns to force page or column breaks. Use the **Type > Insert Break Character** menu command to break columns, frames or pages.
- 3 Do not use word spaces to align text. Unlike typewriter fonts, which are monospaced, most digital fonts are proportionally spaced and will not line up with word spaces. Use tabs to define fixed spaces (see page 27).
- 4 Do not use auto (default) leading. Change your line increments depending on line length, point size and typeface chosen to ensure comfortable reading (see page 11).
- 5 Never use single or double hyphens as dashes. This is another hangover from the manual typewriter. Use en dashes – like they do in most European countries, or em dashes—as in North America. Em dashes need thin spaces on either side of the dash. On the Mac, the keystroke for the en dash is **option+hyphen**, and for the em dash, **option+shift+hyphen**. See page 19.)
- 6 Avoid using asterisks (\*) or hyphens (-) as bullets. The bullet character (•) could be accessed by pressing **option+8**. Press **option+9** for a midpoint (·), a smaller bullet.
- 7 Use a word-processing program to input your text. It is better not to type directly in a layout program. A word-processing program is designed for writing. It makes counting words, editing, and checking spelling or grammar so much easier and lets you focus on the writing rather than how it looks.
- 8 Make sure you have true italic and bold fonts installed on your system. Avoid digitally emboldening or slanting type.
- 9 Do not artificially condense or expand type, unless you know the typefaces are designed with the flexibility for distortion in mind (for example Gerard Unger's Coranto and Vesta, two of the very few exceptions). Use specially designed condensed or expanded versions of a typeface where available.

## Typography on screen

### How is type on screen different?

Unlike typography in print, which depends on light reflecting off the surface of the paper and into the reader's eyes, typography on screen works with light that is emitted directly from the screen into the eyes. The process of reading can therefore be quite tiring. If considerations are not taken to allow for the best possible reading condition, readers can easily be put off by your text. Another essential difference between typography in print and on screen is that of lower resolution. The resolutions of most computer screens are between 72 and 96 pixels per inch, while most of our everyday printed matter is around 2500 dots per inch. Even the common office laser printer has a much higher resolution than the computer screen, at 600 dots per inch. Until screen resolutions

improve to such a degree that they match our current print quality, as designers we have to do our best within the bounds of what seems like a serious constraint.

One of the advantages of typography on screen is that the text has the potential to be dynamic; the semantic value of the text is preserved, rather than being just a stagnant image on paper. This means that the text becomes data that is searchable, sortable and editable. Dynamic text in HTML and XML on websites can be generated by linking to a database of timely information and called upon when needed. Pages can be built on the fly. Most complex websites are database-driven. Another advantage is that hyperlinks can be assigned to words and phrases, allowing cross-referencing and user interaction.

Typography on screen can also take on motion and be combined with sound. Letterforms, words and phrases in this context become actors that are able to tell stories and convey emotions. Television motion sequences and film titles fall within the genre of typography on screen. Type in motion can also be combined with interactivity in websites and mobile applications.

At small sizes (typically the common sizes we would use for print), the number of pixels available to represent each character is small, due to the coarse resolution of the screen. Most issues for typography on screen occur at such small sizes. At large sizes, resolution would not be an issue at all, and the same principles for print typography apply.

#### **Aliasing and anti-aliasing**

Until fairly recently, most computers were only capable of displaying 'aliased' (bitmapped) text on screen. The pixels are either turned on or turned off. This made type look very jagged on screen. Expertly hinted TrueType fonts (see below) should always be used for aliased text.

Anti-aliasing creates the illusion of smooth outlines through the use of varying levels of gray pixels surrounding the outline of the character. Anti-aliasing tends to work better at larger sizes, since the fuzzy outline can result in eye-strain and fatigue. At smaller sizes it might still be best to avoid the use of anti-aliasing. It can be turned off below a preferred point size at the system level.

typography      typography

aliased

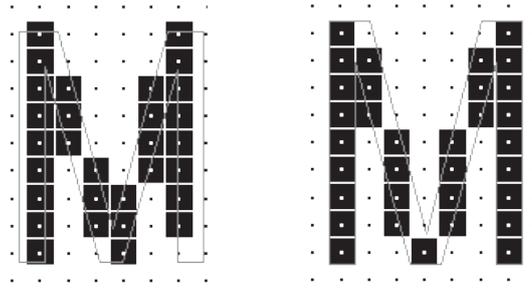
anti-aliased

#### **ClearType**

ClearType is Microsoft's sub-pixel font rendering technology. Different colour values at the sub-pixel level are used (instead of simply tints of the font colour) to give a crisper image of the character. This technology is built into the current version of Adobe Acrobat and Microsoft's e-book Reader, but only work on LCD displays.

### Hinting

In short, hinting is a way for type designers to tell the computer exactly which pixels to turn on for the best possible bitmap image of the characters at small sizes and low resolution. The outline of the characters is modified by mathematical instructions at given sizes in order to turn on the desired combination of pixels.



unhinted

hinted

Image from Microsoft  
Typography, <https://docs.microsoft.com/en-gb/typography/truetype/hinting>

Most Windows and Macintosh system fonts have been expertly hinted for optimum quality and legibility. Expertly hinted fonts are absolutely necessary for older operating systems that do not support anti-aliased display of type, especially for displaying HTML-based websites and word-processing in a business setting. This is perhaps not as crucial in the latest versions of the Macintosh and Windows operating systems, since anti-aliasing is now built-in. Most Postscript Type 1 fonts and Postscript-flavoured OpenType fonts are either not hinted or are hinted poorly. Avoid using these aliased at small sizes.

### Type for HTML-based websites

Most web pages are saved as HTML pages and displayed in browsers. HTML stands for 'HyperText Mark-up Language', a format that allows text to be assigned different attributes and structures. HTML lacks sophisticated layout control and most of the typographic features essential to print typography. In the Internet's early years, basic things like leading, point size, or even what font the text appears in could not be specified by the designer. Finer typographic control is now possible with Cascading Stylesheets (CSS, see below).

In addition to system fonts, it is now possible to use a variety of fonts for websites, either through embedding or the use of web font services such as Adobe Typekit and Monotype's Typecast.

### Cascading Stylesheet (CSS)

Essentially, Cascading Stylesheets are to HTML what stylesheets are to InDesign. CSS are predefined styles that are applied to HTML pages, allowing the separation of content and presentation. Standard HTML tags (like body text, paragraphs, different levels of headings, table cells, etc) can be modified and given more elaborate typographic attributes than what standard HTML is capable of. With CSS, leading, type size, case, letterspacing, colour, alignment, as well as sophisticated layout and positioning can all be specified. CSS can be applied to individual HTML pages, while multiple HTML pages can be linked to an external stylesheet file (.css). Even interactivity actions (links, rollovers, etc.), graphic forms and animations can be specified in CSS.