

# An exploration of the Latin Modern fonts

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Abstract The Latin Modern fonts are a newly-created set of fonts with the principal aim of providing glyphs for as many languages as possible. There is a multitude of little-known font shapes in the package, however, and these will be explored here.

## 1 Introduction

The Latin Modern family<sup>1</sup> is a recent collection of fonts authored by Bogusław Jackowski and Janusz M. Nowacki [1]. They are intended as the successors to Donald Knuth's Computer Modern fonts for the Unicode age, to provide the means for typesetting as many languages as possible that use the Latin-based alphabet. The collection is vast: it contains sixty-nine fonts, each containing almost seven hundred glyphs, at time of writing, with more probable in the future. That's almost 69000 glyphs in total! A very small number of the glyphs are shown in figure 1, chosen mostly at random for their interesting shapes.

The Latin Modern fonts have been created with the MetaType1 system [2, 3], whose programmatic nature makes the idea of dealing with such a huge number of glyphs more palatable. The number of fonts in the collection is greater than the BlueSky Computer Modern Type 1 fonts [4] now used by default by all current L<sup>A</sup>T<sub>E</sub>X distributions, but fewer than in the enormous CM-Super collection (which also provides many glyphs for multilingual typesetting), whose fonts have been auto-traced from bitmaps and hence are of slightly inferior quality [5]. With the most recent releases, OpenType versions of the fonts have been made available for more general use. In this article, we shall look at the fonts the Latin Modern family provides and how they may be accessed in L<sup>A</sup>T<sub>E</sub>X.

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1. This document describes version 0.99.3 of the Latin Modern fonts, which I should note are able to be both freely used and distributed in their provided form.

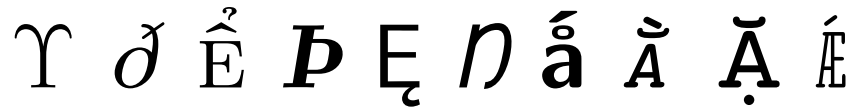


Figure 1: Ten of the 69000-odd glyphs in the Latin Modern collection.

## 2 NFSS refresher

To provide context, some brief details of  $\text{\LaTeX}$ 's font selection scheme are expounded here. Refer to the documentation [6] for further information. Three main families are defined for a document: the default roman, sans serif, and typewriter fonts. These are selected with the `\rmfamily`, `\sffamily`, and `\ttfamily` commands, respectively. Arbitrary font families are requested with the command `\fontfamily{...}`; all such `\font...` commands (more to be seen) must be appended by `\selectfont`, if nothing else, to perform the actual font selection.

Variations along two other font axes (other than family) are possible: series and shape. The former is used to express weight and width, such as bold or condensed, and combinations thereof. We will be using the `\fontseries{...}` command later to look at various weights of the Latin Modern fonts. The shape axis is used to express italics and small caps, among other more esoteric options. We shall be content in the shape axis to use the commands `\itshape`, `\slshape`, and `\scshape` to choose between the italic, oblique, and small caps shapes.

How do we discover all the codes used to express the families, series and shapes for each font? These are all defined within font definition (`.fd`) files, which are supplied one per font encoding. The most common encoding is `T1`, which provides glyphs for many, but not all, European languages. To discover the font shapes available in the Latin Modern collection, then, these files must be located within the  $\text{\TeX}$  distribution. They are found in the `texmf/tex/latex/lm` directory (where this is located will be system dependent), and investigation here will yield all of Latin Modern's secrets.

The encodings currently supported by the Latin Modern fonts in  $\text{\LaTeX}$  are: `T1`, for most European languages; `QX`, a variant of `T1` that is more suitable for Slavonic languages (including the `fk` ligature, cf. `fk`); `LY1`, which supports a mixture of common symbols and accented letters; `T5`, for Vietnamese; and `TS1`, a large collection of miscellaneous symbols to accompany `T1`.

### 3 The same-old

Everyone is familiar with the default T<sub>E</sub>X fonts. The Latin Modern fonts are selected with, in the preamble,<sup>2</sup>

```
\usepackage{lmodern}
\usepackage[T1]{fontenc}
```

which should make barely any visible changes to already existing documents; these fonts are an *extension* of Computer Modern, not a new design.

To begin, the three default families are shown, using common L<sup>A</sup>T<sub>E</sub>X font selecting commands. In the examples shown in this article, indented entries indicate that the previous outdented command(s) are still active.

*Roman* Perhaps simply because he could, Knuth included a large amount of variation in the fonts he designed for T<sub>E</sub>X. Certainly, no one since has really matched his efforts. The descendants of his fonts still bear this curious hallmark: the Latin Modern Roman family contains both slanted *and* italic shapes.

```
\rmdefault      Latin Modern Roman
  \itshape      Latin Modern Roman Italic
  \slshape      Latin Modern Roman Oblique
  \scshape      LATIN MODERN ROMAN SMALL CAPS
  \bfseries     Latin Modern Roman Bold Extended
    \itshape    Latin Modern Roman Bold Italic Extended
    \slshape    Latin Modern Roman Bold Oblique Extended
```

*Sans serif* Variations here must wait until later; here are the ‘standard four’. Note that the sans serif family does not have a true italic, nor small caps.

```
\sffamily       Latin Modern Sans
  \slshape      Latin Modern Sans Oblique
  \bfseries     Latin Modern Sans Bold
    \slshape    Latin Modern Sans Bold Oblique
```

---

2. Change T1 to another option (LY1, QX, T5), or combination thereof, depending on which glyphs you require/which language(s) you are typesetting.

*Typewriter* The italic shape here is perhaps a little unpleasant, and the fact that it has small caps is quite unusual considering that the sans serif family does not.

```
\ttfamily      Latin Modern Typewriter
  \itshape      Latin Modern Typewriter Italic
  \slshape      Latin Modern Typewriter Oblique
  \scshape      LATIN MODERN TYPEWRITER SMALL CAPS
  \bfseries     Latin Modern Typewriter Dark
  \slshape      Latin Modern Typewriter Dark Oblique
```

The majority of the shapes demonstrated above are available in the vector Computer Modern fonts (that is, the current L<sup>A</sup>T<sub>E</sub>X defaults). See Appendix A for a complete comparison of the fonts available in the Computer Modern and Latin Modern collections (most of which we have yet to see). The bold typewriter fonts above, however, are completely new to Latin Modern. While the original METAFONT fonts were completely parameterised such that changes like this were easily possible, its bitmap output format is very outdated and rarely used these days.

## 4 Interlude — optical sizes

In the old days of printing, fonts were made of metal and were literally one to a size. The characters in a font for the body text of a book would look noticeably different to that same font at a larger size for titling. Nowadays, computer-based fonts can be scaled linearly to any size imaginable, but well designed fonts are still made available with variations based on the intended size of the output. In brief, the smaller a font is, the less fine its intricacies must be in order to survive the transfer from (possibly imperfect) printed page or low-resolution screen to eye. Conversely, a font designed to be large can be more delicately rendered.

For the original Computer Modern fonts, designed in METAFONT, the optical size could be chosen exactly for any size. Due to disk space constraints, specific sizes were chosen as canonical, which were then inherited when they were converted to the PostScript Type 1 format. The Latin Modern fonts, in turn, also preserve these canonical sizes for all of the ‘major’ shapes, although such a profusion of optical sizes is almost certainly unnecessary, since there needn’t be such a great range of font sizes in a single document.

Latin Modern Roman, design size 5 pt  
Latin Modern Roman, design size 6 pt  
Latin Modern Roman, design size 7 pt  
Latin Modern Roman, design size 8 pt  
Latin Modern Roman, design size 9 pt  
Latin Modern Roman, design size 10 pt  
Latin Modern Roman, design size 12 pt  
Latin Modern Roman, design size 17 pt

Figure 2: The optical size range of Latin Modern Roman, each font at 12 pt.

The set of optical sizes for Latin Modern Roman is shown in figure 2, the largest number for any of the Latin Modern families. The non-linear nature of the scaling is immediately apparent, and it is quite clear how the characteristics change from robust to delicate, most significantly in the widths and stroke thicknesses of the characters, as the design size increases.

The Latin Modern fonts with a range of optical sizes are: roman upright, italic, oblique, and bold extended; sans upright and oblique; and typewriter upright. These optical size variations constitute 32 of 69 fonts in the collection.

## 5 Non-default weights

As previously mentioned, the Latin Modern collection shares with the Computer Modern fonts some shapes that are not often used in practice, probably due to the fact that they can't be accessed with the 'normal' NFSS commands such as `\emph` and `\textbf`.

### 5.1 Other bold shapes

A non-extended version of the roman bold exists. Unfortunately, it is available in but a single design size (unlike its extended counterpart), and lacks true italics.

<code>\bfseries</code>	<b>Latin Modern Roman Bold Extended</b>
<code>\fontseries{b}\selectfont</code>	<b>Latin Modern Roman Bold</b>
<code>\fontseries{b}\slshape</code>	<i>Latin Modern Roman Bold Oblique</i>

The sans serif family has a similar ‘secret’ bold shape:

```
\sffamily
  \bfseries                Latin Modern Sans Bold
  \fontseries{sbc}\selectfont Latin Modern Sans Demi Condensed
  \fontseries{sbc}\slshape  Latin Modern Sans Demi Condensed Oblique
```

## 5.2 Italic small caps

The slantsc package allows NFSS declarations `\slshape` and `\scshape` to be combined in order to select oblique small caps. (Or `\itshape` for truly italic small caps if they exist.) With `\usepackage{slantsc}`, it is possible to select

```
\scshape\slshape          LATIN MODERN ROMAN OBLIQUE SMALL CAPS
\ttfamily\scshape\slshape LATIN MODERN TYPEWRITER OBLIQUE SMALL CAPS
```

Oblique or italic small caps are scarce in traditional typesetting, but their use is becoming more popular in modern times.

## 5.3 The new typewriter shapes

Quite recently in the lifetime of the Latin Modern collection, the typewriter fonts have been supplemented with extra shapes, including the ‘Typewriter Dark’ fonts previously seen. Also present are light and condensed light shapes, the latter being a  $\frac{2}{3}$  reduction in width; that is, 120 characters in condensed light will fit in the space for 80 regular typewriter letters. Note that every character in every weight and shape of the typewriter fonts has the same width so that the letter grid remains constant when switching between styles.

```
\ttfamily
  \fontseries{dk}\selectfont Latin Modern Typewriter Dark
  \fontseries{dk}\slshape    Latin Modern Typewriter Dark Oblique
  \fontseries{lt}\selectfont Latin Modern Typewriter Light
  \fontseries{lt}\slshape    Latin Modern Typewriter Light Oblique
  \fontseries{lc}\selectfont Latin Modern Typewriter Light Condensed
  \fontseries{lc}\slshape    Latin Modern Typewriter Light Condensed Oblique
```

One may wonder why the light weights were produced. As the medium typewriter face is relatively heavy, it does not have much contrast with the new dark weight; compare the example on page 3 with the one on the previous page. So, in situations in which the bold face is to be used, the light face should be selected as the ‘normal’ typewriter weight. This can be performed with the following declaration in the preamble:

```
\DeclareFontFamily{T1}{lmtt}{}
\DeclareFontShape{T1}{lmtt}{m}{n}{<-> ec-lmtl10}{}
\DeclareFontShape{T1}{lmtt}{m}{\itdefault}{<-> ec-lmtlo10}{}
\DeclareFontShape{T1}{lmtt}{\bfdefault}{n}{<-> ec-lmtk10}{}
\DeclareFontShape{T1}{lmtt}{\bfdefault}{\itdefault}{<-> ec-lmtko10}{}

```

(For the T1 encoding; adapt as required for the other encodings by looking in the ...lmtt.fd files, as discussed in section 2.) The use of `\bfdefault` and `\itdefault` permit font selection with the commands `\textbf` and `\emph`.

## 6 Other families

As well as the secret weights mentioned above, there are entire *families* in the Latin Modern collection of which many people may be unaware.

### 6.1 Sans extended

The family ‘Latin Modern Sans Extended’ (sometimes referred to as ‘Sans Quotation’ due to Knuth’s original use for it) is an extended version of the default sans serif family, intended for use at small font sizes (its nominal design size is 8 pt).

```
\renewcommand\sfddefault{lmssq}
\sffamily      Latin Modern Sans Extended
  \slshape     Latin Modern Sans Extended
  \bfseries    Latin Modern Sans Extended
  \slshape     Latin Modern Sans Extended

```

The variation in sans bold is interesting with regard to the condensed sans shown in section 5.1, but the shapes aren’t entirely suitable for combination since they have different x-heights arising from their different design sizes:

**Condensed Bold Extended**

## 6.2 Typewriter proportional

As the era of teletext computers draws ever more distant, perhaps the idea of a fixed width font can be thought to be archaic. The Latin Modern Typewriter family has an accompanying variable width design, for those who wish to use it:

```
\renewcommand\ttdefault{lmvtt}
\ttfamily                Latin Modern Typewriter Proportional
  \slshape                Latin Modern Typewriter Proportional Oblique
  \fontseries{lt}\selectfont Latin Modern Typewriter Proportional Light
  \fontseries{lt}\slshape Latin Modern Typewriter Proportional Light Oblique
  \fontseries{dk}\selectfont Latin Modern Typewriter Proportional Dark
  \fontseries{dk}\slshape Latin Modern Typewriter Proportional Dark Oblique
```

It can be seen that here, as in the fixed-width typewriter fonts, every alphabet has the same horizontal width. Again, if the bold face is to be used for contrast, better results will be achieved by selecting the light face as default. This can be effected in a similar manner as before: (section 5.3, refer in this case to t1lmvtt.fd)

```
\DeclareFontFamily{T1}{lmvtt}{}
\DeclareFontShape{T1}{lmvtt}{m}{n}{<-> ec-lmvtl10}{}
\DeclareFontShape{T1}{lmvtt}{m}{\itdefault}{<-> ec-lmvtlo10}{}
\DeclareFontShape{T1}{lmvtt}{\bfdefault}{n}{<-> ec-lmvtk10}{}
\DeclareFontShape{T1}{lmvtt}{\bfdefault}{\itdefault}{<-> ec-lmvtko10}{}

```

## 7 Future additions

The Latin Modern fonts are approaching their first final release, but there are still some fonts to incorporate from Computer Modern. In order to provide a complete replacement, the mathematical glyphs need to be adapted, but this will mostly be a job of ‘taking’ them — no new glyphs, at this stage, need to be created.

Two more font shapes will be included: (also look out for a slanted Dunhill)

```
\fontfamily{cmr}\fontshape{ui}\selectfont Computer Modern Unslanted italic
\fontfamily{cmdh}\selectfont Computer Modern Dunhill
```



These fonts exist primarily to demonstrate the ‘meta-ness’ of the Computer Modern fonts, in that obliqueness of the italics and the stem height of the roman, to name but two parameters in the design, may be varied orthogonally. Their use is not particularly widespread.

The Latin Modern team will no doubt continue to supplement their fonts with additional glyphs and variations. I hope they create more ligatures (‘fb’, ‘fj’, ‘fh’, ...) and language-specific features, which will become more useable in the T<sub>E</sub>X world when OpenType starts becoming more the *de facto* font standard (see X<sub>Y</sub>T<sub>E</sub>X for a Unicode-capable T<sub>E</sub>X variant that supports OpenType fonts and their advanced features [7]).

As an example of a language-specific feature, French people (or at least, French *typesetters*) like more space before their punctuation than English-speakers. It is possible to provide for this within the OpenType fonts themselves, to be activated at the discretion of the user, without having to deal with messy ‘Babel-like’ active character techniques that perform this service currently.

## 8 Conclusions

This concludes our tour of the different shapes of the Latin Modern font collection, which are the more multilingual replacements of the vector Computer Modern fonts. They have been exhibited in the belief that they are not as well known as they deserve, for much time and effort has been spent to supplement each of the fonts with hundreds of extra glyphs.

These fonts are already the default in ConT<sub>E</sub>Xt, and in time are planned to become the default fonts in L<sup>A</sup>T<sub>E</sub>X, although exactly when remains to be seen. We have seen some shortfalls and awkwardness with L<sup>A</sup>T<sub>E</sub>X’s font selection scheme in being able to select, in a straightforward manner, the large variety of shapes and weights that the collection offers. Brief examples detailing how to overcome these problems have been given, but more work is required. In the future, we look forward to the creation of a better user interface for this purpose, either specifically for these fonts, or in general with a ‘newer’ font selection scheme.

## References

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- [6] L<sup>A</sup>T<sub>E</sub>X<sub>3</sub> Project Team. *L<sup>A</sup>T<sub>E</sub>X<sub>2</sub> $\epsilon$  font selection*. URL <http://www.latex-project.org/guides/fntguide.pdf>.
- [7] Jonathan Kew. X<sub>Y</sub>T<sub>E</sub>X, the Multilingual Lion: T<sub>E</sub>X meets Unicode and smart font technologies. *TUGboat*, 26(2):115–124, 2005. URL <http://www.tug.org/TUGboat/Articles/tb26-2/kew.pdf>. (Not available to non-TUG members at time of publication).

## A Summary of Computer vs. Latin Modern

The following table summarises the different font shapes and weights available in the Computer Modern (C.M.) and Latin Modern (L.M.) collections. A black bullet (•) indicates the presence of that font(s), and the grey bullet (◐) indicates future plans for it.

It can be seen clearly from this table that the extra fonts in the Latin Modern collection are slanted variants that can be created mechanically: no *new* designs have been created for this project. This indicates where the effort of the project has gone: thousands of extra glyphs and hundreds of thousands of kerning pairs.

FAMILY	SERIES	SHAPE	C.M.	L.M.
Roman	Medium	Upright, Slanted, Italic, Small Caps	•	•
		Slanted Small Caps		•
	Bold	Upright italic	•	◐
		Upright	•	•
Bold Extended	Slanted		•	
	Bold Extended	Upright, Slanted, Italic	•	•
Fibonacci	Medium	Upright	•	
Dunhill	Medium	Upright	•	◐
		Slanted		◐
Sans Serif	Medium	Upright, Slanted	•	•
	Semibold Condensed	Upright	•	•
		Slanted		•
	Bold Extended	Upright	•	•
		Slanted		•
Sans Quotation	Medium	Upright, Slanted	•	•
	Bold Extended	Upright	•	•
		Slanted		•
Typewriter	Medium	Upright, Italic, Slanted, Small Caps	•	•
		Slanted Small Caps		•
	Light, Dark	Upright, Slanted		•
	Light Condensed	Upright, Slanted		•
Typewriter	Medium	Upright, Slanted	•	•
Proportional	Light, Dark	Upright, Slanted		•