

Travels in \TeX Land: Using the Lucida fonts

David Walden

Abstract This paper describes buying, installing, and beginning to use the Lucida fonts. Then it describes some more exploration in the world of fonts in the context of the Lucida fonts.

1 Introduction

In this column in each issue I muse on my wanderings around the world of \TeX . Since this issue is about fonts, I thought it would be appropriate for me to do some wandering in the domain of fonts. Thus, I decided to try to use the Lucida fonts that the \TeX Users Group (TUG) recently made arrangements to sell.

The Lucida fonts were designed by Charles Bigelow and Kris Holmes. They comprise a comprehensive set of fonts (serif, sans serif, bold, typewriter, etc.) aimed at looking good on low-resolution output devices. According to Charles Bigelow,¹ one of the differences between Times and Lucida Bright is that Lucida Bright has a bigger x-height so it looks bigger than Times at the same point size which offers some advantages at small sizes on screen and in laser printing where resolutions are low. However, as PDF has become popular, which allows zooming of documents, a big x-height is not as crucial as it was 18 years ago when Bigelow and Holmes first designed Lucida Bright or 20 years ago when they first brought out Lucida Sans. Also, Lucida Bright is a bit more tightly fitted so it can work well in small sizes in short lines and two- or three column pages in journals and magazines. Lucida Bright has the harmonized Lucida Sans, Lucida Sans Typewriter, Greek, various math symbols, and so on, for a more harmonious look, which many people like, when a seriffed typeface is used with sans-serif, fixed-pitch, and so on.

1. These descriptions are excerpted and slightly paraphrased but substantially quoted from emails from Bigelow to Karl Berry and me. Bigelow also has a more comprehensive description at <http://tug.org/store/lucida/designnotes.html>.

Bigelow makes that further point that even though some of the original motivations for the design of the Lucida fonts are no longer as important as they were (e.g., x-height in today's world where a zoom capability is ubiquitous), the font remains popular because now people just like the look of it. It's one of those form-follows-function deals that happen fairly often in the world of design where a practical or technical solution of one era becomes simply a stylistic look of a later era — like the millions of people who today wear blue jeans for style rather than hard manual work.

The Lucida fonts were originally made available to the \TeX community on a proprietary basis by Y&Y, Inc., of which Berthold and Blenda Horn were the principals. Y&Y created the hints for the Type 1 Lucida fonts and created the necessary \TeX font metrics (`.tfm`) for all of the Lucida fonts, including the fussy details \TeX needs for math typesetting. Y&Y also developed the first set of macros to facilitate use of the Lucida fonts with \TeX . Unfortunately, in 2004 Y&Y went out of business (<http://www.tug.org/yandy/>). Fortunately, TUG was able to make an arrangement with Bigelow and Holmes to continue to make the Lucida fonts available to the \TeX community; for more details, see <http://tug.org/lucida/>.

The macros originally written by Y&Y were later largely superseded for use with standard \LaTeX by macros developed by David Carlisle and distributed as the `lucidabr` package.² Also, Walter Schmidt did significant reorganization, clean-up, and improvement of the \TeX related aspects of Lucida fonts: he updated and rearranged the font metrics, virtual fonts, `fd` files and the related documentation. Lance Carnes, through his company PCTeX, provided sponsorship for Schmidt's work.

PCTeX, Inc. (www.pctex.com) has also arranged with Bigelow and Holmes to distribute the Lucida fonts to the \TeX community. The PCTeX distribution includes the `lucimatx` package, a later package also developed by Walter Schmidt aimed at being an improvement on the `lucidabr` package (the use of which I assume in my discussion in the rest of this column). The `lucimatx` package is available from PCTeX independently of buying the Lucida fonts from PCTeX, for \$15.

Walter Schmidt has explained to me that the PCTeX and TUG distributions

2. The source files says indicates that Sebastian Rahtz also had a hand in improving the Y&Y macros before David Carlisle, and I've heard of some involvement by Karl Berry as well.

contain identical fonts and metric files and thus, there is complete compatibility between the distributions and my discussion in sections 3 to 5 of this column applies to both distributions of the fonts.

2 Buying the Lucida fonts

Let me begin by saying that I have always avoided doing anything significant with fonts in \LaTeX . Installing or using a new font has seemed too complicated to bother with, especially since I don't have a very discerning eye for fonts and those built into \LaTeX and its basic classes seemed good enough to me. So, trying to acquire and use the Lucida fonts is my first significant fonts effort.

The Lucida fonts are available from TUG at <http://tug.org/store/lucida/>. I clicked on this URL and then clicked where it says, "general order form for the Lucida fonts" which took me to <http://tug.org/store/lucida/order.html>. There I put a number 1 in the box for "Lucida Complete - Individual Member" (with a price of \$90) and then clicked the "Order Lucida fonts" button. That resulted in a message page saying to "Please go back to fix errors: You must indicate that you accept the TUG end user license terms to order Lucida fonts." So I went back and checked the box next to "Please read the TUG Lucida end-user license and then check here if you accept the terms" and then again clicked the "Order Lucida fonts" button.³

"Order Lucida fonts" took me to a page where I could give my credit card number, name, address, etc. I filled in what appeared to be needed and clicked on "Order Complete"; however, it told me I had failed to check the type of my credit card. (I've often wondered why on-line sales require the user to say VISA, Master Card, or whatever. I would have assumed that information was somehow implicit in the credit card number. Is it not?)

I checked the box for my type of credit card and clicked on "Order Complete" again. The TUG server displayed a nice receipt for me to print out that said, "Thank you very much for your order. The TUG office will notify you when it has

3. Notice that I said nothing about reading the <http://tug.org/store/lucida/> page or reading the end user license terms. I suspect that I am like many users who download computer software. I want or need to use it and so I figure I'm stuck with whatever terms the seller requires. Hopefully I'm not agreeing to anything too crazy.

been processed.”⁴ That made it sound like nothing would happen immediately, so I went back and read the first two paragraphs of the “Order Lucida fonts” page which told me (second paragraph), “We regret that, at present, access to the Lucida fonts is not instant. A human must review your order and process your payment. We make every effort to do this within 24 hours or less, and send you the access information for the fonts. Please feel free to contact the TUG office if there is a delay.” This was sort of a relief. It was easy enough to order the Lucida fonts, but since it was Sunday, I probably wouldn’t have to do any frustrating work like trying to actually install the Lucida fonts until probably at least Monday. Whew!

3 Downloading and installing the Lucida fonts

Once my payment to TUG for the Lucida fonts was processed, I was given a URL to a location in the TUG server store. I clicked on that and accepted the option of downloading to my computer a zip archive called `lucida-complete.zip`. The instructions that came with the downloaded zip archive told me to unzip it into my local `texmf` directory, if I had one. I do, so I did.

Unfortunately, my first attempt at unzipping caused a problem. Allume’s Stuffit Delux program which I use on my MS Windows XP system created a directory `localtexmf/lucida-complete` and unzipped the Lucida distribution into that directory. However, the correct installation of the Lucida file structure is for it to be distributed across the `doc`, `tex`, `fonts`, etc., directories that reside immediately below `localtexmf`, exactly as in the zip file without any intervening directories. Thus, I had to delete the `localtexmf/lucida-complete` directory and to try another unzip program. The 7-zip File Manager program did the correct unzipping of `lucida-complete.zip` to the destination `localtexmf`.

The instructions for installing the Lucida fonts next told me to refresh the file name database. I use MikTeX as it comes with TUG’s 2004 ProTeXt distribution. With MikTeX and Windows XP, one refreshes the file name database by clicking the Start button, clicking Programs on the resulting menu, clicking MikTeX on the next resulting menu, clicking MikTeX Options, and clicking the Refresh Now button on under the General tab of the MikTeX Options dialog window.

4. The TUG server also sent me an email that contained the same information as the receipt.

4 First try with the Lucida fonts

Having installed the Lucida fonts, it was time to use them. My first use was this column. Click on the link on the HTML page for this paper for the file [pre-lucida.pdf](#) to see how this column worked before using the Lucida fonts. To convert this column to use of the Lucida fonts, I followed the installation instruction where it told me to look at the file [doc/fonts/lucida/lucida-sample.pdf](#) in my local `texmf` directory. I skipped to the top of the second page of that file and followed the instruction telling me to put the following code at the beginning of my \LaTeX file:

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{textcomp}
\usepackage{lucidabr}
```

except I specified the `pracjourn` class of this journal rather than the `article` class. Then I simply recompiled the file for this column with `PDFLaTeX`, and everything seemed basically to work. See the file `walden.pdf` to see the resulting output.

5 Some more exploration

According to the [doc/fonts/lucida/lucida-sample.pdf](#) file, there are lots of other aspects of the Lucida fonts that my use of them with this column thus far doesn't illustrate. Therefore, my next effort was a little artificial exercise aimed solely at finding what else I see about the extent of the Lucida fonts and getting a grasp on how to effect each.⁵ The right side of each line shows the \LaTeX commands to causes the font changes shown on the left side of each line. Read [doc/fonts/lucida/lucida-sample.pdf](#) to get a little understanding for the need for the `\fontfamily` and `\selectfont` stuff below. In section 6, I'll say more about the \LaTeX `shape`, `series`, and `family` font commands.

5. This exercise is adapted (almost copied, really) from the [doc/fonts/lucida/lucida-sample.tex](#) file that comes with the Lucida distribution. That document and its `.pdf` file noted above contain additional information that I don't include here.

LucidaBright	
LUCIDABRIGHT-SMALL CAPS	\scshape
<i>LucidaBright-Italic</i>	\itshape
<i>LucidaBright-Italic</i>	also works with \em
<i>LucidaBright-Oblique</i>	\slshape
LucidaBright-Demi	\bfseries
LUCIDABRIGHT-DEMI-SMALL CAPS	\bfseries\scshape
<i>LucidaBright-DemiItalic</i>	\bfseries\itshape
LucidaSans-Typewriter	\ttfamily
<i>LucidaSans-Typewriter Oblique</i>	\ttfamily\slshape
LucidaSans-Typewriter Bold	\ttfamily\bfseries
<i>LucidaSans-Typewriter BoldOblique</i>	\ttfamily\bfseries\slshape
LucidaSans	\sffamily
<i>LucidaSans-Italic</i>	\sffamily\itshape
LucidaSans-Demi	\sffamily\bfseries
<i>LucidaSans-DemiItalic</i>	\sffamily\bfseries\itshape
LucidaSans-Bold	\sffamily\fontseries{ub}\selectfont
<i>LucidaSans-BoldItalic</i>	\sffamily\itshape\fontseries{ub}\selectfont
Lucida Typewriter	\fontfamily{hlct}\selectfont
<i>Lucida Typewriter Oblique</i>	\fontfamily{hlct}\selectfont\slshape
Lucida Typewriter Bold	\fontfamily{hlct}\selectfont\bfseries
<i>Lucida Typewriter BoldOblique</i>	\fontfamily{hlct}\selectfont\slshape\bfseries
LucidaFax	\fontfamily{hlx}\selectfont
<i>LucidaFax-Italic</i>	\fontfamily{hlx}\selectfont\itshape
LucidaFax-Bold	\fontfamily{hlx}\selectfont\bfseries
<i>LucidaFax-BoldItalic</i>	\fontfamily{hlx}\selectfont\itshape\bfseries
LucidaCasual	\fontfamily{hlcn}\selectfont
<i>LucidaCasual-Italic</i>	\fontfamily{hlcn}\selectfont\itshape

<i>LucidaCalligraphy-Italic</i>	<code>\fontfamily{hlce}\selectfont</code>
<i>LucidaHandwriting-Italic</i>	<code>\fontfamily{hlcw}\selectfont</code>
<i>LucidaBlackletter</i>	<code>\fontfamily{hlcfl}\selectfont</code>

6 Lucida and math

Personally, I don't use math in my L^AT_EX work to any significant extent. Thus, I have not tried the math fonts here, with one trivial exception. For extensive examples of use of the Lucida fonts for math, see the file `lucida-amsmath.pdf` which accompanies this column.

There is one issue slightly related to math that I will mention. I have been in the habit of using `\{`, `\}`, and `\backslash` to produce the left brace, right brace, and backslash characters in some situations, for example, in verbatim text in footnotes. Because my eye has not been very sensitive about fonts, I never paid much attention to the result.

However, with the Lucida typewriter font, the difference between fonts in `\this{}` and `\this{}` is apparent, even to me. Thus, I was reminded that in L^AT_EX one can get left and right braces simply by typing `\{` and `\}` which have the advantages of not switching to a math font and being fewer characters to type.

The problem with using `\backslash` to produce a backslash became particularly apparent when I tried to produce the characters `\ /` while discussing italic correction in the following section. I never knew before that L^AT_EX has the built-in command `\textbackslash` for just this purpose and which can be used to produce a better version of `\ /`. (I confess, however, that I actually switched to mostly using `\char'\` to produce backslashes in typewriter mode. It is stranger looking but fewer characters to type than `\textbackslash`, although I slightly worry it is some sort of violation of good L^AT_EX programming practice.)

7 Lucida and the NFSS

Although I have used L^AT_EX for a number of years, I have never really learned more about fonts than is described in section 4.1 of Kopka and Daly’s *Guide to L^AT_EX, Fourth Edition*, and I skipped reading some of what was there. I had previously looked at several more comprehensive descriptions of the New Font Selection Scheme (NFSS), but my eyes always glazed over after a sentence or two. I’m just not interested in reading documentation in the abstract. However, now that I was actually loading and trying to use the Lucida fonts (and had the set of font files in front of me to look at), it seemed like a good time to try again to understand more about NFSS. So, I carefully reread section 4.1 and then skimmed Appendix A of Kopka and Daly’s book.

The point of the NFSS is apparently to make the font “attributes” be as independent of each other to the greatest extent possible, that is, to the extent there are fonts available to support the different combinations of attributes. There are (more or less) five sorts of attributes:

- Family (typewriter, sans serif, and Roman, i.e., serif)
- Shape (upright, italic, slanted, and small caps)
- Series (medium weight or boldface)
- Size (5pt, 7pt, 8pt, 9pt, 12pt, etc.)
- Encoding (OT1, T1, TS1, etc.)

So, in some sense we want available to us all of the elements in the cross-product of these attributes:

$$family \times shape \times series \times size \times encoding$$

7.1 Family, shape, and series

In the first three groups of examples of section 5, we saw independent use of declarations of font families, shapes, and series.

There we also saw an example of a font declaration that doesn’t quite fit in a family, shape, or series: `\em`, for “emphasis.” The declaration `\em` is the same as `\itshape` if the mode is already non-italic; but, if the mode is already italic, `\em` switches to a non-italic mode. However, it may be better to use the

`\emph` command form (noted below) of this declaration because it also puts italic correction at both ends of the italic text so the user does not have to do it manually with `\/`.

There is one other font declaration that doesn't quite fit in a family, shape, or series: `\normalfont`, which switches things back to a defined default. The `\normalfont` declaration was used for the first example in section 5 (LucidaBright alone). The default font is defined in the `lucidabr` style file that was loaded with the `\usepackage{lucidabr}` command.⁶

There is a font command parallel to each font declaration. The whole set is:

Family

```
{\rmfamily ...} \textrm{...} % serif font
{\ttfamily ...} \texttt{...} % typewriter font
{\sffamily ...} \textsf{...} % sans serif font
```

Shape

```
{\upshape ...} \textup{...} % upright font
{\itshape ...} \textit{...} % italic font
{\slshape ...} \textsl{...} % slanted font
{\scshape ...} \textsc{...} % small caps font
```

Series

```
{\mdseries ...} \textmd{...} % medium weight font
{\bfseries ...} \textbf{...} % boldface font
```

Other

```
{\normaltext ...} \textnormal{...} % default font
{\em ...} \emph{...} % emphasis font
```

The font declaration names can also be used for environments, for example:⁷

6. Lots of other things relating to use of the Lucida fonts are also defined in the style file. There is a parallel style file, **lucbmath**, for when a user only wants the Lucida math fonts.

7. Morten Høgholm says that he prefers creating a new environment, e.g,

```
\newenvironment*{fontchange}[1]{#1\ignorespaces}{}
\begin{fontchange}{\itshape\bfseries} Text. \end{fontchange}
```

which he says, “gives you the option to combine declarations, and it is a proper environment.”

```
\begin{itshape}
. . .
\end{itshape}
```

7.2 Size

L^AT_EX has commands such as the following for selecting the font size: `\tiny`, `\small`, `\normalsize`, `\large`, `\huge`, etc. Like many other font sets, Lucida set of fonts is scaled geometrically from one set of fonts and, thus, any size from 1 point to a very large number of points is available. Between them, the class file one is using plus the `lucidabr` package define the size of the fonts that are mapped into each of the font size commands.

7.3 Encoding

At the top of the `.tex` file for this column, between the document class command and the command to load the `lucidabr` style package, we find these two commands:⁸

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

These commands have to do with the coding attributes.

Each font has a certain number of characters in it. Historically, fonts had 128 characters, and this is the default that comes with the Computer Modern fonts that are the L^AT_EX default. Today, many fonts have 256 characters. Also, there must be a mapping between the individual characters and the character positions in the font (that is, between a particular character and a number between 0 and 255). The command `\usepackage[T1]{fontenc}` specifies the so-called Cork coding of 256 characters. *There is no support with the Lucida fonts for L^AT_EX's default OT1 encoding.* The `\usepackage{textcomp}` command makes available an auxiliary coding (TS1) of almost 100 special characters known as the Text Companion fonts (see Table 7.6 on page 363 of *The L^AT_EX Companion, Second Edition*).

8. See page 5 for the complete sequence.

7.4 The generalized font selection commands

As is implicit in the last five groups of examples in section 5, some of the fonts we want may be outside the defaults that comes with the `lucidabr` style file. Thus, to select these fonts, we must use the lower level commands. The section 5 examples used the following commands `\fontfamily`, `\fontseries`, and `\selectfont` in addition to the usual font declarations.

The NFSS uses six lower level commands to specify the font to be used, and the usual font declarations used earlier in this section translate into these six lower level commands:

```
\fontencoding{ }  
\fontfamily{ }  
\fontseries{ }  
\fontshape{ }  
\fontsize{ }{ }  
\selectfont
```

Various of the first five commands above are given to select the desired parameters of the font, and then the `\selectfont` command is given to actually select the font.

Table 7.25 on page 414 of *The L^AT_EX Companion* shows nine “weight class” and nine “width classes” that can be used with the `\fontseries` command; one of these weight classes, `ub`, is used in the examples in section 5 specify ultra bold. The most common series parameters are `m` for medium (normal) weight and `b` for bold.

Table 7.26 on page 415 of *The L^AT_EX Companion* shows six “shape classifications” that can be used with the `\fontshape` command. Four of them seem to be used with the Lucida fonts: `n` (normal), `it`, `sl`, and `sc`. There is no explicit use of this command in the examples of section 5.

Table 7.27 on page 416 of *The L^AT_EX Companion* shows over twenty possible “standard font encodings” for use with L^AT_EX. The Lucida fonts support the `T1`, `TS1`, and `LY1` encodings.

The `\fontsize` command takes two parameters — a font size and a baseline skip size. Page 415 of *The L^AT_EX Companion* gives this example:

```
\fontsize{14.4}{17}
```

which means 14.4pt or \Large characters with a 17pt space from the baseline of one line of letters to the baseline of the next line of letters.

The parameter of the \fontfamily command appears to be part of the names of the actual font files that come with the distribution. For instance, Lucida Casual's \fontfamily{hlcn} command in section 5 appears to refer to files for three different codings (T1, TS1, and LY1) of a specific font — the files named ly1hlcn.fd, ly1hlcn.fd, and ly1hlcn.fd. In any case, following is a chart from a file named lucida.txt by Walter Schmidt that is part of the Lucida distribution. Notice that the codes with an asterisk in the first column are the codes that are shown in \fontfamily commands in the examples of section 5.

NFSS classification

=====

family	series	shape(s)	FontName(s)
hlh	m, b	n, it, sl, sc	LucidaBright, LucidaBright-Italic, LucidaBright-Demi, LucidaBright-DemiItalic, LucidaBrightSlanted, LucidaBrightSmallcaps, LucidaBrightSmallcaps-Demi
hlhj	m b	n, it, sc n, sc	LucidaBright, LucidaBright-Italic, LucidaCalligraphy-Italic, LucidaBright-Demi, LucidaBrightSmallcaps, LucidaBrightSmallcaps-Demi
hls	m, b, ub(*)	n, it	LucidaSans, LucidaSans-Italic, LucidaSans-Demi, LucidaSans-DemiItalic, LucidaSans-Bold, LucidaSans-BoldItalic
hlct(*)	m, b	n, sl	LucidaTypewriter, LucidaTypewriterBold,

hlst	m, b	n, sl	LucidaTypewriterOblique, LucidaTypewriterBoldOblique LucidaSans-Typewriter, LucidaSans-TypewriterOblique, LucidaSans-TypewriterBold, LucidaSans-TypewriterBoldOblique
hlx(*)	m, b	n, it	LucidaFax, LucidaFax-Italic, LucidaFax-Demi, LucidaFax-Italic
hlce(*)	m	it	LucidaCalligraphy-Italic
hlcn(*)	m	n, it	LucidaCasual, LucidaCasual-Italic
hlcw(*)	m	it	LucidaHandwriting-Italic
hlcf(*)	m	n	LucidaBlackletter

Acknowledgements

Karl Berry suggested this project and helped me all along the way. Charles Bigelow reviewed section 1 for accuracy and allowed his words to be used and paraphrased. Walter Schmidt also reviewed section 1 for accuracy and provided words for me to paraphrase. Will Robertson provided better definitions of the \TeX and \LaTeX logos to work with the Lucida fonts in the context of the `pracjourn` class. Morten Høgholm reviewed section 7 on NFSS for accuracy and suggested several important corrections and improvements. Two anonymous reviewers also provided suggestions for improvement, as did editor Lance Carnes.

Biographical note

David Walden is retired after a career as an engineer, engineering manager, and general manager involved with research and development of computer and other high tech systems. More history is at www.walden-family.com/dave.