Welcome to MacTEX

Welcome to MacTEX

Welcome to MacTEX

fogadtatás

ようこそ

bienvenida

kaabọ

chào mừng

歡迎

добродошао

Welcome to MacTEX

Welcome to MacTEX

Welcome to MacTEX

Table of Contents

What You Can Do with MacTeX

MacTeX is an OS X install package providing a completely configured and ready-to-use version of TeX Live. Produced by TeX User Groups worldwide, TeX Live consists of the TeX typesetting system and friends such as LaTeX, XeTeX and LuaTeX. TeX Live enables you to create any variety of documents[1], from wedding invitations to books. You work with an editor such as TeXShop or a graphical user interface program such as LyX.
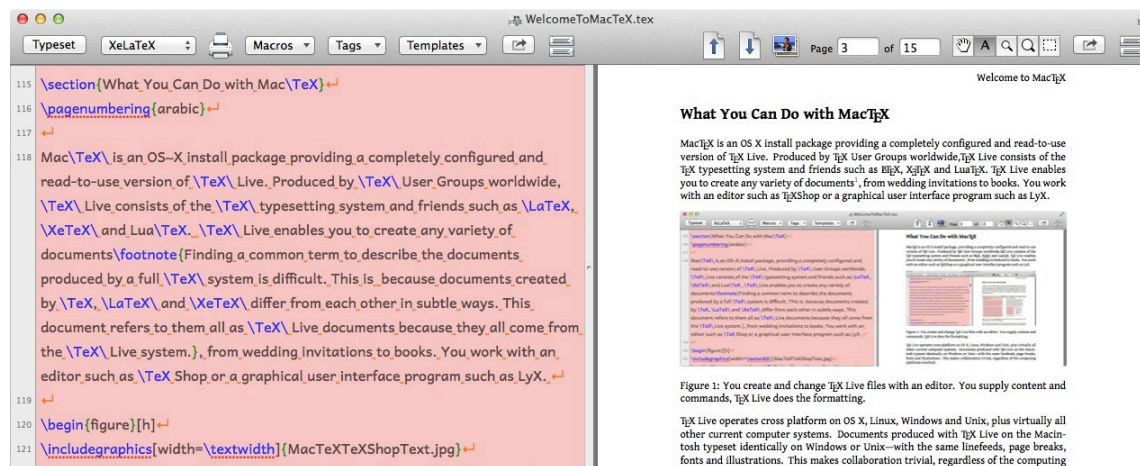

Figure 1: You create and change TeX Live files with an editor. You supply content and commands. TeX Live does the formatting.

TeX Live operates cross platform on OS X, Linux, Windows and Unix, plus virtually all other current computer systems. Documents produced with TeX Live on the Macintosh typeset identically on Windows or Unix—with the same linefeeds, page breaks, fonts and illustrations. This makes collaboration trivial, regardless of the computing platforms involved.

What you can do with TeX Live depends on your familiarity with its capabilities. You can use TeX Live for almost all types of printing and publishing activities—from very simple to extremely detailed:

- ⇒ Write a letter or publish a memoir.
- ⇒ Design a poster or create a product catalog.
- ⇒ Generate a brochure or produce a textbook.
- ⇒ Construct a newsletter or fashion an annual report.

You can print your output or package it as a PDF or publish it as HTML. In fact, you can do almost anything with TeX Live—from a publishing point of view.

---

[1]Finding a common term to describe the documents produced by a full TeX system is difficult. This is because documents created by TeX, LaTeX and XeTeX differ from each other in subtle ways. This document refers to them all as TeX Live documents because they all come from the TeX Live system.

An Overly Modest View of TeX

TeX—the original ancestor of TeX Live—is a free, multilingual typesetting system designed "for the creation of beautiful books—and especially for books that contain a lot of mathematics."[2] While this understated official description comes from TeX developer Donald E. Knuth, it may make the system sound very specialized. The opposite is true. In addition to beautiful equations, TeX produces the most beautiful text available for general publishing. But, does this really matter in the era of email, tweets and texts? Give it a try. Your love letters, business communications and mathematical treatises may benefit.

Word Processors, TeX and Formatting

Near the beginning of the personal computer era, developers created word processing. Since then, word processors have gained some text manipulation and page layout abilities. But essentially all 21st Century word processors publish text the same now as then—exactly as you type it. Word processor marketers used to call this *What You See Is What You Get*. They abbreviated it as WYSIWYG and pronounced it as *whiz-e-wig*, or something similar. WYSIWYG works in more or less one way. When you type:

```
Hello.          I
love        you.
Won't         you tell        me your
          name.
```

your obedient software prints everything just as you entered it:

```
Hello.          I
love        you.
Won't         you tell        me your
          name?
```

While this may be nice on occasion, suppose you were nervously hurrying and typing poorly. Your output in this circumstance may look like a harassment note instead of a first indication of possible affection. But TeX can take care of that.

Type the exact same thing in TeX Live—with the exact same spacing and line breaks—and you could very easily get:

Hello. I love you. Won't you tell me your name?

---

[2]Donald Ervin Knuth. *The TeXbook*, Volume A of Computers & Typesetting. Addison-Wesley, Reading, Mass., 1986. ISBN 0201134470.

TeX Live corrects your spacing—not your spelling—and line breaks. And it uses a beautiful font and color you requested. This is for most purposes much better than WYSIWYG. Aware of the differences of their system over conventional word processors, TeX users sometimes refer to WYSIWYG as WYSIAYG—or *What You See Is All You Get.*

What makes the difference between TeX Live and word processing? Formatting!

The Difference Rests in the Formatting

With a word processor, you do the formatting—with its potential inconsistencies. As you word process, you must remember to format everything—every time. From a TeX perspective, amazingly efficient software does the formatting and leaves the content to you. You tell TeX what you want and it does everything as you like it.

But suppose you want to do all of the formatting? Can you do that with TeX?

Of

course

you

`can…`

if you really want to. But TeX eases the tasks of formatting, plus it produces beautiful typography.

Hints of What TeX Live Can Do for You

TeX Live creates beautiful documents according to the commands you use. It comes with hundreds of built-in primitive commands and hundreds of additional ones created by combining primitives into so-called *macros.* A sample macro might combine two primitives—`\sl` for *slanted text* and `\bf` for **bold text**—to make a `\section` command with ***slanted bold*** text. When you tell TeX Live to format some text using this `section` heading, the heading takes on the appearance of the command you specify. This same concept applies to every division head, paragraph, sentence, word and character in your document. You provide the instructions. TeX does the formatting.

As a more specific example, a section heading may appear as bold characters, 12 points in size, using Copperplate font with small caps:

A Hypothetical Section Heading

In addition to fonts, the command for a section heading would also define space above and below the text, text alignment and other typographical controls. If you want to alter the appearance of the section heading, you modify its settings. The changes show up everywhere you use the section heading in your document.

But, this just touches the surface because TeX Live provides extreme flexibility.

A Sampler of What TeX Live Does

TeX Live helps make publishing convenient and consistent by controlling almost every aspect of document formatting. This benefits people in everyday life by saving time once you learn TeX Live. As a real-world example, an economics consulting company saved 200 hours of production time each month by switching preparation of its detailed reports from a page publishing program to TeX Live. When thoughtfully implemented, TeX Live can help recover lost time by managing the formatting of your documents. This section provides a sampling of the things TeX Live can do to lighten the formatting load so you can concentrate on content. But first you need to understand some limitations.
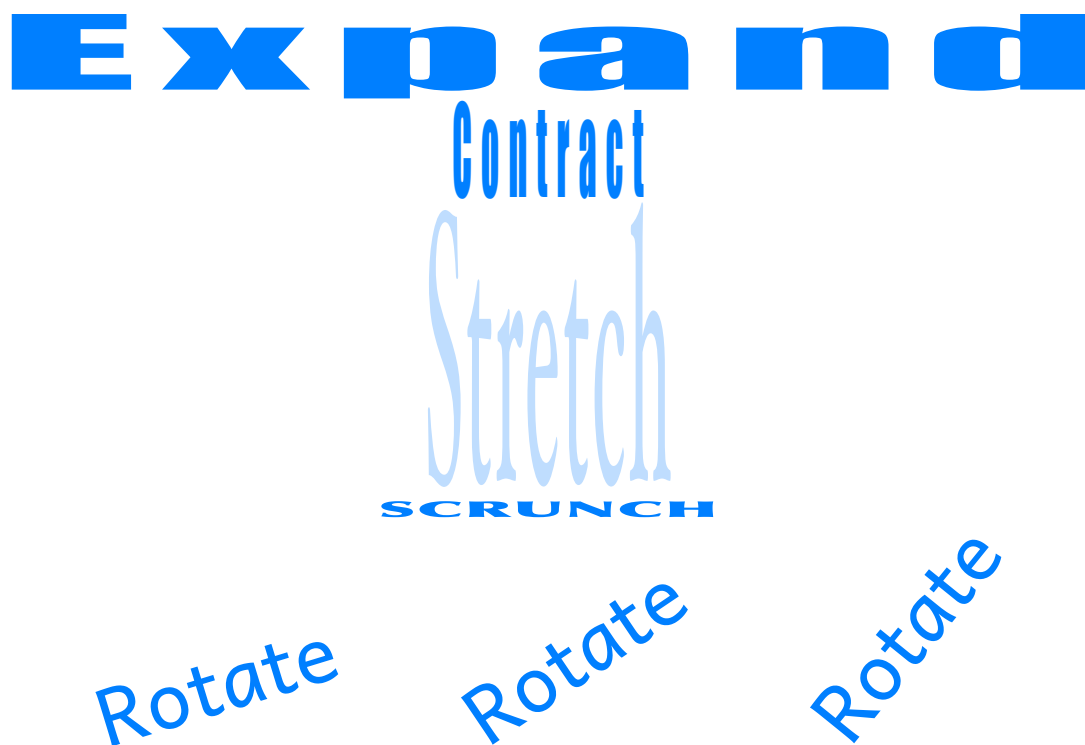
Figure 2: Reshaping words with TeX Live.

About TeX Live Limitations and Fixes

TeX Live is not all-things-publishing to all people. But its flexibility makes it come close. Consider some limitations of the popular LaTeX format. A format consists of a structured group of related TeX macros. These macros define everything from page margins to character styles.

LaTeX is the primary and most well-known format of TeX. Originally the work of developer Leslie Lamport, LaTeX provides macros to easily access most TeX functions, such as

setting up document structures, creating tables of contents, generating indexes and constructing various types of lists. But it also defines document formatting from the viewpoint of one person, the developer. The formatting macros in LaTeX never work for everyone—unmodified, that is. For example, out-of-box LaTeX implements multiple columns as one column or two. A new page begins each time you switch between one and two columns. This can produce some genuine pain when designing a document with varying numbers of columns. LaTeX also defines typographic standards according to the tastes of the developer. While thoughtfully designed, these standards do not meet the needs of everyone.

To address these issues, LaTeX offers access hooks into its macros for making minor changes. LaTeX also contains designed-in flexibility for other developers to alter and extend its capabilities and behaviors.

The majority of users bend LaTeX to their needs by using classes and packages to alter and extend its capabilities.

Classes define structures for document types such as letters, articles, reports and books. Developers can and do create new classes designed to meet their own needs. One such class implements multiple columns with the ability to change the number of columns within a single page.

Packages alter and extend classes. Some provide commands to customize text formats. Others add new functions, such as creating hypertext links, making magazine style layouts and customizing headers and footers.

You can find dozens of classes and hundreds of packages on CTAN—the Comprehensive TeX Archive Network—all for free. When you need a specialized capability, there is probably a package waiting to serve your needs.

In summary, while formats such as LaTeX may not provide all design elements you need, classes and packages probably can. Sometimes you may need to search a little to find a class or package to fit your need. Sometimes you may need to create your own format, class, package or macro. You can also modifying existing ones.

Document Structures

TeX Live defines document structures using classes. You can choose from various document styles, including classes for letters, articles, reports and books—the four built-in classes of LaTeX. Classes provide commands for setting up document elements such as title pages, tables of contents, abstracts, acknowledgements, bibliographies and indexes, plus division levels for parts, chapters, sections and paragraphs.

Identical commands usually produce different results across various classes. For instance, section headings look differently in articles and books. Additionally, articles insert no page breaks between their titles, tables of contents and text. Report and

book title pages and tables of contents appear on separate pages. Finally, some common commands are not available in all classes. This applies to document division commands in the letter class, because letters generally need no section headings. However, you can find workarounds to add formatted section headings to letters, if you really need to.

Classes enable flexibility for creating anything from newsletters to technical manuals to annual reports. You can also design your own classes, but doing this requires some expertise.

Figure 3: Having Fun with Reflections.

Page Margins, Odd and Even Numbered Pages, Columns

Good page design varies with the purpose of your publication and its means of distribution. For example, the specifications of odd and even numbered pages depend on the final destination of your project. When printing on one side or not printing at all, you may want all pages to look the same. For two-sided printing, you may oppositely offset odd- and even-numbered pages to create binding margins. You may increase white space for margin notes or narrow the margins to reduce the number of printed pages. The amount of text and graphic columns you choose varies with page width and size of graphics.

These considerations and others make page design complex and potentially difficult to manage. TEX Live classes and packages provide commands to make page design easier. Classes specify default margins, page layout and number of columns. You can change these with class options and commands from page-design packages. To make life easier, some packages allow you to specify just the measurements you want to control—left and rights margins, for example—and then automatically adjust all other settings to match the best practices of publishing.

Division Levels, Tables of Contents, Indexes

Division levels provide a framework for your publication, making it easier to understand at a glance. A table of contents and an index makes information easier to find, especially in large documents.

Articles prepared in TeX Live contain three levels of sections plus paragraphs. You can number the division headings or make them unnumbered. You can also number paragraphs. Reports add chapters above the sections. Each chapter automatically starts on a new page, but you can override this. You can also require all chapters to start on either odd-numbered or even-numbered pages. Books provide optional parts in addition to the chapters. Parts automatically start on new pages. You can number pages consecutively throughout your publication, or restart numbering at specified document divisions.

TeX Live creates tables of contents from your division headings plus optional additional manual entries. The contents section can also create lists of figures, tables and equations. For large projects you can produce a summary contents at the beginning of the document and detailed contents after the title page of each major division.

With TeX Live you can also make single-level or multiple-level indexes. You can also create multiple indexes with different purposes, for example a topic index and an index of locations.

Cross References and Hyperlinks

Cross references and hyperlinks make documents easier to navigate. Cross references tell readers where to find information in the current document—see page 2 to read a quote from the original developer of TeX. Hyperlinks create connections to external locations, such as the website of the original developer of TeX.

Cross references can guide your reader to specified tables, figures, equations, sections and pages—all by number. In addition to going to web addresses, hyperlinks can direct readers to other locations inside your document—such as a list of things you can do—when you publish your document as a PDF. When you activate hyperlinks with the hyperref package, the entries in your table of contents, index, footnotes and bibliography automatically become internal hyperlinks.

Footnotes, Glossaries, Bibliographies

Footnotes, glossaries and bibliographies provide explanations, clarifications and scholarly background information for your documents.

TeX Live can generate footnotes or endnotes with document-wide sequential numbers or numbers restarted at division levels. You can format your footnotes to match the requirements of your publication. Once they are formatted, they stay formatted.

Bibliography creation in TEX Live provides an extraordinary number of options through formats, classes, packages and styles[3]. Together, these allow you to create and publish a list of resources in any standard style. You can also create one to meet your own needs. You can find existing bibliography styles to match the requirements of almost all academic institutions, professional publications and scholarly journals. Many of these organizations can provide you with their style definition for TEX bibliographies. You can manually enter your bibliographic sources into TEX source files or create an external database. For an external database, you can manually create your list of sources or use one of the computer-assisted research tools, such as BibDesk—a very helpful application.

TEX Live provides commands for creating one or more glossaries. These allow you to create lists of terms and definitions while leaving the formatting to TEX Live.
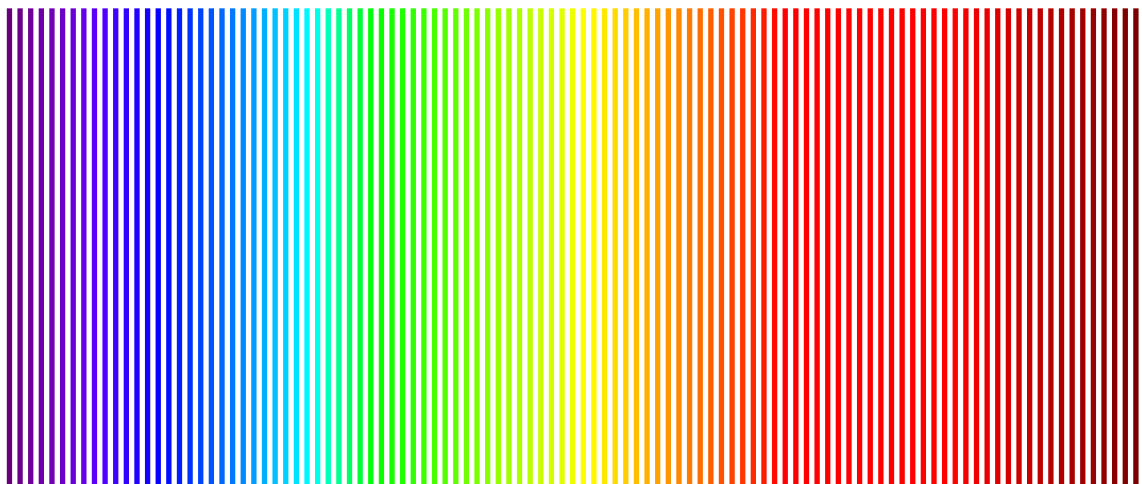

Figure 4: Color Rules by Lightwave Length. See xcolor package for details.

Floats—Graphics, Tables and Equations

Floats provide flexibility in publishing graphics, tables and equations. Each of these objects goes inside a specialized wrapper called an environment. Environments can move outside the normal flow of text. For example, a table may float to the top of a page, away from its neighboring text but still nearby. Floats can also move to the bottom of a page or simply stay where you originally placed them if you disable their ability to float. In some cases you tell all floats to move to the end of a section. You can then guide readers to your graphics, tables and equations through cross-referencing as described on page 7.

Table floats can contain any type of information including rows and columns of tabular data. Graphics from external sources—such as jpeg images—float in the figure

---

[3]Bibliography styles tells TEX Live how to format bibliography entries.

environment. You can scale, crop, position and rotate graphics. With a special type of picture environment you can draw pictures by specifying the sizes and locations of basic objects—lines, circles, arrows and text. Equation floats contain beautifully type-set equations, the primary motivation for the original development of TₑX. All floats provide for captions and can appear in the lists below the table of contents.

Languages, Fonts, Characters and Unicode

In the beginning, TₑX could work for any language built around roman characters—A, B, C...—and basic diacriticals—Á, Â, Å.... And it could typeset ligatures—Æ, Œ.... Today, TₑX Live typesets in almost any language with a TrueType or OpenType font. And it still does diacriticals and ligatures, plus old style numbers, small caps and many other typographical features. It can type Japanese hiragana, katakana and kanji, plus Chinese kanji and other ideographic characters.

TₑX typesets right-to-left, left-to-right and top-to-bottom.

It also supports languages[4] such as:

Afrikaans	Czech	Icelandic	Luba-Katanga	Nyankole	Swedish
Aghem	Danish	Igbo	Luo	Oromo	Swiss German
Akan	Duala	Indonesian	Luyia	Polish	Taita
Albanian	Dutch	Irish	Macedonian	Portuguese	Tajik
Asu	Embu	Italian	Machame	Romanian	Tasawaq
Azerbaijani	English	Japanese	Makhuwa-Meetto	Romansh	Teso
Bafia	Esperanto	Jola-Fonyi	Makonde	Rombo	Tongan
Bambara	Estonian	Kabuverdianu	Malagasy	Rundi	Turkish
Basaa	Ewe	Kabyle	Malay	Russian	Turkmen
Basque	Ewondo	Kalaallisut	Maltese	Rwa	Ukrainian
Belarusian	Faroese	Kalenjin	Manx	Samburu	Uzbek
Bemba	Filipino	Kamba	Masai	Sango	Vietnamese
Bena	Finnish	Kazakh	Meru	Sangu	Vunjo
Bosnian	French	Kikuyu	Meta'	Sena	Welsh
Breton	Fulah	Kinyarwanda	Mongolian	Serbian	Yangben
Bulgarian	Galician	Kirghiz	Morisyen	Shambala	Yoruba
Catalan	Ganda	Koyra Chiini	Mundang	Shona	Zarma
C. Atlas Tamazight	German	Koyraboro Senni	Nama	Slovak	Zulu.
Chiga	Greek	Kwasio	Ngomba	Slovenian	
Chinese	Gusii	Langi	North Ndebele	Soga	
Congo Swahili	Hausa	Latvian	Norwegian Bokmål	Somali	
Cornish	Hawaiian	Lingala	Norwegian Nynorsk	Spanish	
Croatian	Hungarian	Lithuanian	Nuer	Swahili	

---

[4]This is a partial list compiled from the languages supported by fonts in the Mac OS X fonts library.

Lists—Enumerate, Itemize, Description

TₑX Live does lists nicely. The types of lists include:

Itemized These lists separate items with bullets.

> ⇒ いち。【一】
> ⇒ に。【二】
> ⇒ さん。【三】

Enumerated Once you set them, numbered lists stay numbered. They never renumber themselves or combine themselves with previous or next numbered lists, areas where word processors struggle.

1. Ready.
2. Set.
3. Go.

Description Description lists are for items needing long explanations.[5]

> **One** A single unit; as, one is the base of all numbers.
>
> **Two** The sum of one and one; the number next greater than one and next less than three; two units or objects.
>
> **Three** The number greater by a unit than two; three units or objects.

TₑX Live—An Aptitude for Details

The foregoing attributes provide a small sampling of what TₑX Live formats for you. And there is more. From here its aptitudes become more subtle as it forms characters into words, words into lines, lines into paragraphs and paragraphs into pages. It correctly typesets left-to-right, right-to-left and vertically. It works to create smooth margins with evenly spaced words and without character spacing. It manages widow and orphan lines and attempts to prevent difficult page breaks. Sometimes it requires manual intervention. But overall, it saves time and gives you the most beautiful results available, at least equivalent to the best commercial typesetting software—sometimes better.

---

[5]The definitions of One, Two and Three are from 1913 Webster.

Children of TeX—Using Your System Fonts

Dr. Knuth developed TeX in the 1970s and froze the code in the early 1980s. At the time, he also developed his own fonts to use with TeX. He named them Computer Modern. When he made TeX available to others at no cost, he included the fonts. They naturally served as the standard for many years. But most things age.

Despite the age of TeX in terms of computer systems—its output quality still exceeds that of 21st Century word processors and most commercial page publishing software. However, fonts have changed dramatically since the 1980s, including the introduction of Unicode fonts for international typesetting. Based on this evolution, several developers began modifying TeX to use Unicode fonts and the system fonts of your computer.

The first such application to gain widespread use was XeTeX, originally developed by Jonathan Kew and now taken over by others. It came with extensions to TeX, plus an expansion of LaTeX called XeLaTeX. XeTeX provides easy access to most TrueType and Open-Type fonts. It supports Apple Advanced Typography and Graphite, a smart-font technology developed by SIL International. XeTeX supports general publishing and technical publishing, including mathematics. It is compatible with most existing TeX and LaTeX classes, packages and macros. This document was created using XeLaTeX, Graphite fonts and other TrueType and OpenType fonts. The cover page was created entirely with XeLaTeX, as were figures 2, 3 and 4.

Another project using Unicode fonts is LuaTeX. LuaTeX is still in its early stages of development. Its most interesting feature is its ability to directly access typesetting functions in the TeX systems. It is compatible with LaTeX and XeTeX.

The point here is the ongoing development of TeX and its offspring. TeX Live is a living and mature free publishing system with thousands of users worldwide and a huge support network.

About The Learning Curve

If you use the built-in styles of a word processor, you can learn to use TeX Live. Even if you do not use word processing styles, you can still learn. As with any new software, there is a learning curve for TeX Live, even on the Macintosh. But you are never alone when learning TeX Live. This is because MacTeX itself receives support from one of the most active groups of users for any publishing software. The Internet contains thousands of TeX tutorials, FAQs and examples. They exist on mailing lists, wikis, blogs, websites and bulletin boards worldwide.

You can also benefit from the knowledge of people using TeX on Unix, IBM mainframes, Windows and other systems. Because TeX operates the same on all machines, knowledge gained on the Mac instantly translates to TeX wherever it works. And visa-versa.

Resources

Books

These are commonly used. If you really want to understand TEX, then read *The TEXbook*, written by Donald E. Knuth, the original developer. It makes LATEX, X∃TEX and other children of TEX easier to understand. *The METAFONTbook* is about the software used to make the originals TEX fonts.

Michael Doob. *A Gentle Introduction to TEX: A Manual for Self-Study*. CTAN, 1993. This is a free PDF available from CTAN: http://ctan.org/pkg/gentle.

Victor Eijkhout. *TEX by topic: a TEXnician's Reference*. Addison-Wesley Pub. Co., Woking-ham, England, 1992. ISBN 0201568829. While this book is out print, you can download a free PDF of the book from CTAN: http://ctan.org/pkg/texbytopic.

Michel Goossens. *The LATEX Graphics Companion*. Addison-Wesley, Upper Saddle River, NJ, 2nd ed edition, 2008. ISBN 9780321508928 (pbk. : alk. paper).
URL http: //www.loc.gov/catdir/toc/ecip0713/2007010278.html.

Donald Ervin Knuth. *The TEXbook*, Volume A of Computers & Typesetting. Addison-Wesley, Reading, Mass., 1986. ISBN 0201134470.

Donald Ervin Knuth. *The METAFONTbook*, Volume C of Computers & Typesetting. Addison-Wesley, Reading, Mass., 1986. ISBN 0201134454 (hard).

Donald Ervin Knuth. *Digital Typography*, CSLI Lecture Notes; No.78. CSLI Publications, Stanford, Calif., 1999. ISBN 1575860112 (cloth : alk. paper).
URL http://www.loc.gov/ catdir/description/cam029/98027331.html.

Leslie Lamport. *LATEX: A Document Preparation System: User's Guide And Reference Manual*. Addison-Wesley Pub. Co., Reading, Mass., 2nd ed edition, 1994. ISBN 0201529831.

Frank Mittelbach, Michel Goossens, Johannes Braams, and Chris Rowley. *The LATEX Com-panion*. Addison-Wesley, Boston, 2nd ed. edition, 2004. ISBN 0201362996 (pbk. : alk. paper).

Web Resources

MacTEX Website:
http://www.tug.org/mactex/

TEX Live Website. TEX Live is the parent distribution of MacTEX:
http://www.tug.org/texlive/

Current Version of Welcome Doc

This is Version 2.0 of Welcome to MacTEX. Distributed on May 20, 2015

You can find the current version of this document at: http://www.tug.org/mactex/

This document was prepared by Bob Kerstetter. Thanks to Karl Berry, Dick Koch and Herb Schulz for proofreading and making suggestions. The author is responsible for its content, including any omissions and errors. Send your comments to tex@villagehiker.com.

Change History

May 20, 2015   Original release of Version 2.0 Oct 28, 2016   Released Version 2.1 with spelling corrections.