

The Suitability of the L^AT_EX Text Formatter
for Thesis Preparation by Technical and
Non-technical Degree Candidates in Fulfillment of
the requirements for the degree of

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Glossary

- a: : replacement text which customizes a **TEX** macro for each particular usage.
- b: -up: a copy of a file to be used when catastrophe strikes the original. People who make no back-ups deserve no sympathy.
- b: : an element of a program's memory. A buffer's inherent finitude limits the capacity of computer programs.
- c: sequence: the normal form of a command to **TEX**.
- d: : something, often a character, that indicates the beginning and ending of an argument. More generally, a delimiter is a field separator.
- d: style: a file of macros that tailors **LATEX** for a particular document. The macros described by this thesis constitute a document style.
- d: style option: a macro or file of macros that further modifies **LATEX** for a particular document. The option "[chapternotes]" constitutes a document style option.
- f: : illustrated material, including graphs, diagrams, drawings and photographs.
- f: : a character set (the alphabet plus digits and special symbols) of a particular size and style. Some fonts used in this thesis are: twelve point roman, *twelve point roman slanted*, and ten point typewriter.
- f: : a note placed at the bottom of a page, end of a chapter, or end of a thesis that comments on or cites a reference for a designated part of the text.
- f: : (as opposed to a word-processor) arranges printed material according to instructions imbedded in the text. A word-processor, on the other hand, is normally controlled by keyboard strokes that move text about on a display.
- LATEX**: : A version of **TEX** that has been pre-loaded with a very sophisticated set of macros.
- m: : a user-defined control sequence.
- m: package: a set of macros that combine for a single purpose. The macros of **LATEX** constitute a macro package.
- p: : an arbitrary constant.
- p: : a unit of length. One pica is twelve points and six picas is about an inch.
- p: : a unit of length. 72.27 points equals one inch.
- p: : a machine that produces a printed page also referred to as an output device. Printers for **TEX** are almost always either laser printers or typesetters.
- r: : a conventional printing typestyle. This thesis is set in roman type.
- r: : a straight printed line; e.g., .
- t: : information placed in a columnar arrangement.
- TEX**: : simply the ultimate in computerized typesetting.

t: : either a masterjs thesis or a doctoral dissertation. This document also refers to itself as a thesis, although it really is not one.

The author wishes to express sincere appreciation to University Computing Services, where he has had the opportunity to work with the `TEX` formatting system; to Leslie Lamport, author of the `LATEX` macro package; and to Donald Knuth, *il miglior fabbro*.

Chapter 1

Introduction

The `TeX` format, developed by Donald Knuth, is well documented and, until recently, a degree candidate had no recourse but to submit his or her thesis to a typist for completion. Revisions were difficult and time consuming, and even at its best the resultant thesis still looked typed. The advent of computerized typesetting has revolutionized thesis preparation, and `TEX` in particular brings to the university student the power and flexibility of a professional, industrial-strength typesetter.

`TEX` is a complete and professional typesetting system. It has been programmed to produce the same document on all machines, so a suitable printer can always be found for the final copy while drafts are made on more conventional and inexpensive printers. The suitable standard is a 300 dot-per-inch laser printer, which is excellent for thesis production. True camera-ready publication quality typesetting is available for those who can afford such luxury. Sources for this typesetting capability may be found in the `TUGboat` [TUG\do5(p)].

1 The Purpose of This Sample Thesis

This sample is a demonstration of the quality and propriety of a `LATEX` formatted thesis, and is documentation for the preparation of a thesis. It has made extensive use of a specialized style file developed specifically for the preparation of theses at the University of Washington. Chapter II discusses `LATEX` as described by Lamport [Lbook]. Chapter III describes the additional macros and functions provided by the thesis document style. Finally, Chapter IV discusses some special problems due to the inherent differences among the various computers and printers that support `LATEX`.

It must be emphasized that, although it is feasible, and even appropriate, for a computer science graduate to format his or her own thesis without help, non-specialists should not expect to be able to do so. The `TEX` format specification of a thesis, indeed of any real document, is long and complex. Fortunately, `TEX` provides a means to predefine new commands and spare the typist most of the sometimes esoteric details of the formatting language. `LATEX` is an example of such a predefinition. `LATEX`, in turn, allows the further customization by style files. The thesis macros described herein constitute a style file. Included in this style are most of the structures commonly found in theses. A student, armed with only a reading of the `LATEX` manual [Lbook] can follow this example and produce most of a thesis. It is of course impossible to predict all the formatting problems one will encounter and there will be problems that are best handled by a specialist. Help is available at University Computing Services, or can very likely be found in your own department.

Figures, tables, and tables of contents are all examples of otherwise difficult areas that are simplified by the `LATEX` macro package, Chapter notes are an example of a

further difficulty overcome by the thesis document style file. One formatting challenge that will remain such is the typesetting of mathematical equations. These are a speciality of `TEX` and are well treated by Knuth[book] and to a lesser extent by Lamport[Lbook]. It happens that most people involved with equations are technically minded and should find these exercises quite enjoyable.

2 Conventions and Notations

In this thesis the typist refers to the user of `LATEX` the one who makes formatting decisions and chooses the appropriate formatting commands. He or she will most often be the degree candidate.

This document deals with `LATEX` typesetting commands and their functions. Wherever possible the conventions used to display text entered by the typist and the resulting formatted output are the same as those used by the `TEX`books. Therefore, `typewriter type` is used to indicate text as typed by the computer or entered by the typist. It is quite the opposite of *italics*, which indicates a category rather than exact text. For example, "alfa" and "beta" might each be an example of a *label*. That italic type is also used for emphasis should cause neither concern nor confusion.

3 A Disclaimer

This sample thesis was produced by the document style it describes and is acceptable to the Graduate School[SP]. However, the use of this package does not guarantee acceptability of a particular thesis, nor does the Graduate School recommend these macros, or the `TEX` formatter, over any other package or formatter.

Chapter 2

A Brief

Description of TEX

The TEX formatting program is the creation of Donald Knuth of Stanford University. It has been implemented on a wide variety of computers and produces ~~Exactly~~ specifically excludes the inherent variety in print devices. the same copy on all machines. Among the popular computers that support TEX are the mainframes operated by University Computing Services, most other mainframes about the campus, and several microcomputers including the IBM PC and its ~~Computer~~ University has a site license for PC-TEX. It is available from the Microcomputer Showroom at no charge to students, faculty, and staff of the ~~University of~~ University of ~~TEX~~ TEX ~~and the~~ Apple Macintosh ~~Mac~~ Mac TEX from FTL Systems. The Microcomputer Showroom has more information. There is also a world-wide users group which provides computer-dependent information, classes, and a newsletter the *TUGboat*.

1 What are they; why are they spelled that way; and what do really long section titles look like in the text and in the Table of Contents?

TEX is a formatter. A document's format is controlled by commands embedded in its text. The peculiar look to the names indicate that TEX is also a typesetting program. Each character and rule on the page is precisely positioned. LATEX is a special version of TEXna TEX preloaded with a voluminous set of macros that simplify most formatting tasks.

TEX uses *control sequences* to control the formatting of a document. These control sequences are usually words or groups of letters prefaced with the backslash character (?). For example, Figure ? shows the text that printed the beginning of this chapter. Note the control sequence "

Chapter 3

''

that instructed `TEX` to start a new chapter, print the title, and make an entry in the table of contents. It is an example of a macro defined by the `LATEX` macro package. The control sequence `"TEX"`, which prints the word `TEX`, is a standard macro from the `TEXbook`. The short control sequence `"` in the title instructed `TEX` to break the title line at that point. This capability is an example of an extension to `LATEX` provided by the thesis document style.

```
\chapterA Brief\Description of \TeX  
  
The \TeX\ formatting program is the creation of  
Donald Knuth of Stanford University.
```

Figure 1: The beginning of the Chapter II input file.

Most of the time `TEX` is simply building paragraphs from text in the input files. No control sequences are involved. New paragraphs are indicated by a blank line in the input file. Hyphenation is performed automatically, except for few words that `TEX` fails to hyphenate properly. A list of these appears in the `TUGboat`[`TUG\s\do5`(`i`)].

1 TEXbooks

The primary reference for `LATEX` is `Lamport[Lbook]`. It is easily read and should be sufficient for thesis formatting. If you cannot afford that you should obtain the `UCS LATEX introduction`[`UCS\s\do5`(`T`)`eX`].

Most students contend that the `Knuthjs TEXbook`[`book`] is difficult but it is the complete `TEX` reference. Each chapter is composed of paragraphs of varying degrees of difficulty called, in order of increasing esoteria, introductory, `kdangerous bendl`, and double `kdangerous bendl`. A reading of the introductory sections is invaluable, even for `LATEX` users. Except for mathematicians and complex table builders, few thesis typists will encounter the `kdangerous bendl` conditions of the `TEXbook`.

2 Mathematics

The thesis macro style does not expand on `TEXjs` or `LATEXjs` comprehensive ~~Although many of the TEXjs and LATEXjs documents~~ contain no mathematics save the page numbers, it seems appropriate that this paper, which is in some sense *about* `TEX`, ought to demonstrate an equation or two. Here then, is a derivation of the *Nonsense Theorem*.

Assume a universe E and a symmetric function $\$$ defined on E , such that for each

there exists a ϕ , where $\phi(i) = 1$. For each element i of E define R_i . Then if RR is that subset of E where $1+1=3$, for each i

The *TEXbook* devotes four full chapters and exactly one hundred exercises to this problem; it is thoroughly covered.

3 Languages other than English

Many Western languages such as Spanish and French use the same letters as does English, although they employ accent marks more often. *TEX* formats text in these languages with relative ease. Other languages, such as Greek, Arabic, or Chinese, are much more difficult. Students should consult their department or contact the Humanities and Arts Computing Center for assistance.

Characters from other languages can be defined via the font maker (documented by Knuth[*Metafont*]). The definitions are not trivial. Students who attempt to print a thesis with custom fonts may soon proclaim,

k"7027 **o*****^*** *~***.l

Chapter 4

The Thesis Unformatted

This chapter describes the thesis style package in detail and shows how it was used to format the thesis.

1 The Control File

The source to this sample thesis is contained in a single file only because ease of distribution was the primary concern. You should not do this. Your task will be much easier if you break your thesis into several files: a file for the preliminary pages, a file for each chapter, one for the glossary, and one for each appendix. Then include a control file to tie them all together. This way you can edit and format parts of your thesis much more efficiently.

Figure ? shows a control file that might have produced this thesis. It sets the document style, with options and parameters, and formats the various parts of the thesis but contains no text of its own.

```
% LaTeX thesis control file
\documentstyle[footnotes]thesis
\begindocument

% preliminary pages
%
\prelimpages
\input prelim

% text pages
%
\textpages
\input chap1
\input chap2
\input chap3
\input chap4

% bibliography
%
\bibliographystyleplain
\bibliographyuwthesis

% appendices
%
\appendix
\input appxa
\input appxb

\enddocument
```

Figure 1: A thesis control file (`thesis.tex`).

This file is the input to **LATEX** that will produce a thesis. It contains no text, only commands which direct the formatting of the thesis.

The first section defines the document style loading both the thesis macros, "thesis.sty", and your specific macros, "mymac.sty". It also sets global parameters. This thesis has specified bottom-of-page footnote placement. Section ? more fully explains footnotes as used by the thesis document style.

A partial thesis is easily formatted by inserting the comment character (%) before each unwanted section.

2 The Text Pages

A chapter is a major division of the thesis. Each chapter begins on a new page and has a Table of Contents entry.

2.1 Chapters, Sections, Subsections, and Appendices

Within the chapter title use a "
" control sequence to separate lines in the printed title (recall Figure ?.). The "
" does not affect the table of contents.

Format appendices just like chapters. The control sequence "" instructs L^AT_EX to begin using the term iappendixj rather than ichapterj.

Sections and subsections of a chapter are specified by "

A "

and "

A.1 "

respectively. In this thesis chapter, section, and subsection titles are written to the table of contents. Consult Lamport[Lbook, pg. 160] to see which subdivisions of the thesis can be written to the table of contents. The "

" control sequence is not permitted in section and subsection titles.

Very long titles, or titles with mathematics, may write table of contents lines that are too long for some T_EX implementations to handle. You can manually shorten these lines by including the "" anywhere in your titles. The control sequence has no effect on your document but only breaks lines in the intermediate files.

A.2 Footnotes

Specify the placement of footnotes only once as a document style option. Select "[footnotes]" to place the note text at the bottoms of pages; "[chapternotes]" to place it at the ends of chapters; and "[endnotes]" to place it at the end of the thesis. If you don't specify anything you get the "[footnotes]" style. The footnote text is printed automatically for the first style and manually for others. Put the control sequence "" at the end of each chapter to print the chapternote text and, as you might expect, put "" at the end of all the chapters to print the endnote text. Chapternote text begins on a new page and appears in the table of contents as a section. Endnote text appears as an independent chapter. Both of these control sequences have no effect if the appropriate option has not been selected.

You can use the control sequence to make a footnote, even though the functionality may differ from L^AT_EX standard.

In order to format correctly, multiple note specifications must manually include

~~Footnote~~ "e.g., "

Long footnotes, or footnotes containing a lot of T_EX commands, can be awkward

to include with the text. Instead, you can store them in a separate file and read them with " This is an extension to L^AT_EX.

A.3 Figures and Tables

Earlier versions of the Style Manual also included items called `kplatesl`, which were actual mounted photographs. These are now included in `figures`. [SP, pg. 16]

Standard L^AT_EX figures and tables, see Lamport[Lbook], normally provide the most convenient means to position the figure. Facing caption pages [SP, pg. 15] are the sole exception to this rule. These are captions for full page figures or tables, and appear on the left-hand page (facing the illustration on the right-hand page). They are formatted with a "[pf]" figure or table positioning option which functions very similarly to "[p]" option except that the page number and binding offset are reversed from their normal positions. If figure ?, for example, had required a full page its caption (on a facing caption page) might have been formatted as shown in figure ?.