

# Understanding L<sup>A</sup>T<sub>E</sub>X Based on Plain T<sub>E</sub>X Experience

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January 13, 2003

## Abstract

An incomplete example file for the article style in L<sup>A</sup>T<sub>E</sub>X2e is given. Someday it will be in better shape. [We can always hope, can't we?] This abstract is put on a separate page with the titlepage style. As you can see we didn't use it here.

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## Preface

This is a short preface. I wish I could write a longer one but I am short of time at this moment. This is a short preface. I wish I could write a longer one but I am short of time at this moment. This is a short preface. I wish I could write a longer one but I am short of time at this moment. This is a short preface. I wish I could write a longer one but I am short of time at this moment.

This document is still in its formative stages. As a veteran PLAIN  $\TeX$ er, it took me years to overcome  $\LaTeX$ -phobia, but once I did, as occurred recently (1990, not so recent), I realized that it was about as silly as  $\TeX$ -phobia which is a common disease that I have often attacked. There are not really a whole new set of commands to learn. Well, there are, but it is pretty painless since you only need them basically for formatting your text and with examples this is not very problematic. And the new stuff is pretty logical so the learning time is short. Many of the things one does while PLAIN  $\TeX$ ing still apply, in particular all of the  $\TeX$  primitives. [In fact although L $\text{\AA}$ TEX has its own commands for certain things, you can continue to use PLAIN tex or TEX primitives that have almost the same function without getting into trouble usually. This is one of the best kept secrets of the L $\text{\AA}$ TEX people, but not useful if you are sharing your document with a publisher who wants standard  $\LaTeX$ .] For someone who doesn't already know  $\TeX$ ,  $\LaTeX$  immediately provides the tools for doing complicated documents quickly and in a quite sophisticated way. The key is to have plenty of examples. The books  *$\LaTeX$  for Engineers and Scientists* by David J. Buerger[Org 89] or  *$\LaTeX$  For Everyone* by Jane Hahn[Hahn 91] partially solve this problem, but until one gets one's hands dirty actually using the stuff, it can seem more overwhelming than it is. [Now there are more such books[5, 6], the best of which seems to be  *$\LaTeX$  Line By Line* by Antoni Diller[7]. Ask bob to see a copy of any of these. And  $\LaTeX$  has become  $\LaTeX_{2\epsilon}$  (which in turn have become  $\LaTeX_{2.09}$  and  $\LaTeX$  respectively.)

bob jantzen

# 1 First Section

## 1.1 First Subsection

### 1.1.1 First Subsubsection

This is the first sentence of the first subsubsection of the first subsection of the first section of the document. This is the second sentence of the first subsubsection of the first subsection of the first section of the document.

This is the first numbered equation

$$x = y . \tag{1}$$

and that's the truth.

### 1.1.2 Second Subsubsection

Blah, blah blah. Blah, blah blah.

This is not the first numbered equation

$$x \neq y . \tag{2}$$

and that's the truth. But here is an unnumbered equation

$$e = mc^2 .$$

## 1.2 Second Subsection

This is not the first sentence of the first subsubsection of the first subsection of the first section of the document. This is not the second sentence of the first subsubsection of the first subsection of the first section of the document.

# 2 Second Section

This is not the first sentence of the first subsubsection of the first subsection of the first section of the document. This is not the second sentence of the first subsubsection of the first subsection of the first section of the document.

## 3 Third Section

### **The First Real Section Since So Far We Have Been Playing Games to Understand the Sectioning Commands and the Table of Contents**

This title is obviously too long for a sane table of contents so we will use the optional argument to shorten the entry. If we want to do a book style document,

then the headline macro is useful to invoke. Also you will notice that the preface didn't get added to the table of contents. Uncommenting the extra line above after the preface takes care of that.

If you like the plain tex macro `\eqalign`, you can still use it inside the equation environment. It is nicer than the latex command `\eqarray`. Here is a multiple alignment

$$\begin{array}{l} x = y , \quad y = z , \\ y = z , \quad z = w . \end{array} \tag{3}$$

[Almost all of the file PLAIN.TEX is loaded by LATEX when it executes: it reads in LPLAIN.TEX which is an edited copy of PLAIN.TEX with just a few PLAIN tex commands commented out since LATEX has some commands which take their place. However, by putting the commented out parts in your macro file, you can re-activate them. In this way many of the things you have been doing in PLAIN tex can be continued in LATEX. In particular, definitions of macros for symbols almost never cause problems. BOBMACROLA.TEX contains these alignment macros.]

Notice that it is really easy to refer to a specific equation using the `\label` inside the equation environment. For example the last equation was Eq. 3 but the abbreviation one uses for equation before the number is anybody's guess.

Well, we really should do some indexing and bibliographing, but I'm not ready for that yet, so we'll just end here. (You can use your own reference style in the text if you do the reference list by hand.) Thanks for your time.

## 4 Citing, Cross-References and Bibbing

Well, it is important to give an example of this stuff [Org 89] since it is a bit tricky to catch on to quick. The Latex Manual explains things pretty well in several places [Lamp 84, p. 73] but seeing it work helps a lot. The references in the text follow the square bracket notation and the optional argument of the command `\cite` is printed after the reference number or identifier inside the brackets following a comma [Lamp 84, Org 89, Hahn 91]. By using the optional argument of `\bibitem` one can override the default style of consecutively numbered references and instead use the tag in the default argument [Jant 90].

The only drawback to this method is that one has to order the bibliography items in the order in which they appear in the text when using the consecutive number style. On the other hand one can create a bibliography database with all the references normally needed for one's field and use the bibtex facility to automatically do the bibliography. We'll wait a bit before trying that out.

We still have to do the cross-referencing example [Lamp 84, p. 72]. Next time. Oops, we got that in the previous section. Below we give two examples of bibliography styles.

## 5 The PLAIN T<sub>E</sub>X Commands Within LaTeX

For a PLAIN T<sub>E</sub>X-er who starts L<sup>A</sup>T<sub>E</sub>X-ing, it is important to know that most of the PLAIN macros are still available. L<sup>A</sup>T<sub>E</sub>X differs from plain tex in the following way. Instead of reading in PLAIN.TEX when you start up T<sub>E</sub>X, it reads in LPLAIN.TEX which in turn reads in L FONTS.TEX (containing the L<sup>A</sup>T<sub>E</sub>X font setup) and LATEX.TEX (all the standard L<sup>A</sup>T<sub>E</sub>X macros common to all the document styles). [Fonts are now handled differently... (2002)] The file LPLAIN.TEX is just a copy of PLAIN.TEX altered minimally to avoid conflict with L<sup>A</sup>T<sub>E</sub>X. The significant changes are

`\centering` → `\@centering`    what? who cares ...

**font stuff** → the file L FONTS.TEX has the new font stuff

`\tabs` → replaced by array environments

`\beginsection` → L<sup>A</sup>T<sub>E</sub>X has its own sectioning commands

`\dots` → defined to be the same as the math mode macro `\ldots` which itself can work in text or math mode now

`\bye` replaced by the `document` environment begin and end commands

`\eqalign` and `\eqalignno`, `\leqalign` are replaced by the `eqarray` environment

**output macros** L<sup>A</sup>T<sub>E</sub>X has its own output of course

`\footnote` is modified by L<sup>A</sup>T<sub>E</sub>X

`\dotsinsert` → L<sup>A</sup>T<sub>E</sub>X has its own way of doing inserting

`\magnification` → `11pt`, `12pt` options to `\documentclass` (L<sup>A</sup>T<sub>E</sub>X2.09: `\documentstyle`) or a list of different fontsize macros shown on page 115 of the manual

Note that both PLAIN T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X use command strings with the non-letter character @ treated as a letter in their macro files so that the user does not inadvertently make a private definition which screws up the internal PLAIN or L<sup>A</sup>T<sub>E</sub>X macros which use this name. This is done by temporarily changing the character code of @ to be that of a letter and then changing it back at the end of the macro file. L<sup>A</sup>T<sub>E</sub>X even has two convenient macros `\makeatletter` and `\makeatother` to do this when you need it. (You'll know when if ever.) When the `\documentclass` (L<sup>A</sup>T<sub>E</sub>X2.09: `\documentstyle`) macro at the beginning of your L<sup>A</sup>T<sub>E</sub>X file is read it changes the @ character, reads in the macros of the optional style files between the square brackets (if any), and then changes it back. Suppose you extract a macro definition (including necessary related macros) from such macro file. You can then change it and input it (with `\input`) in after your `\documentstyle` (`\documentclass`) command to override or change existing definitions or introduce new ones, but you must either put in the @

character changing macros in the macro file or before and after the input command. See the accompanying macro file BOBMACROLA.TEX for an example of re-instating the PLAIN macro `\equalign` and adding some useful variations.

One can also continue to use the vertical space macros of T<sub>E</sub>X itself like `\hskip` and `\vskip` although L<sup>A</sup>T<sub>E</sub>X has some new ones, and `\smallskip`, `\medskip`, and `\bigskip` still are explicitly used. Although L<sup>A</sup>T<sub>E</sub>X has its own macro definition commands, one can still use `\def` usually without trouble.

It is worth mentioning that every L<sup>A</sup>T<sub>E</sub>X file must have three commands:

```
\documentclass<[<style options>]>{<document style>}
<macros, etc. go here>
\begin{document}
<the document goes here>
\end{document}
```

[`\documentclass` is `\documentstyle` in L<sup>A</sup>T<sub>E</sub>X2.09] There are four standard document styles: article, report, book, and letter, with slight changes in sectioning structure and page setup, but journals, abstract submissions, and proceedings often have their own specific document style(class). Options like `11pt`, `12pt`, `titlepage`, ... then modify those default styles.

For longer documents, the command `\include{filename}` can be used to input chapters or sections of the document from separate files, and the command `\includeonly{<filename1,filename2,...>}` can be used to L<sup>A</sup>T<sub>E</sub>X only those parts of the document listed, while retaining information about correct pagenumbers and crossreferences from the non-L<sup>A</sup>T<sub>E</sub>X-ed parts.

## 6 Lists

L<sup>A</sup>T<sub>E</sub>X has some nice predefined lists which are environments that one begins and ends: `itemize` (unnumbered or bullet list), `enumerate` (numbered list), and `description` (you provide the word for the item title, like a definition list in HTML). You can combine them in various levels of lists, and the labeling (if relevant) is automatically taken care of.

- train
- plane
- car

1. train
2. plane
3. car

**first** train

**second** plane

**third** car

You can also force newlines within the list items by using the command `\newline`.

## 7 Longer Documents: Smart Organization

For a longer document, it pays to create separate files for the separate chapters or the style's largest divisions, and use the `\includeonly` and `\include` commands to allow you to partially LATEX only selected divisions as you work on them or make corrections. All required information (correct pagination, etc) from the files not listed in the `\includeonly` is read from the auxiliary files from the previous LATEX'ing of the document. The following example, for a book or report style with chapter divisions, will LATEX only the first two chapters, if the chapter files are of the form `chapter1.tex` etc.

```
\documentclass<[<style options>]>{<document style>}
<macros, etc. go here>
\includeonly{chapter1,chapter2}
\begin{document}
\include{chapter1}
\include{chapter2}
\include{chapter3}
\end{document}
```

One changes the argument of the `\includeonly` command continuously in creating and modifying a document, as well as commenting it out for LATEX'ing the whole document at once. However, it is sufficient that each division is LATEX'ed twice before final output, even if it has been done separately.

## 8 L<sup>A</sup>T<sub>E</sub>X2e: the new L<sup>A</sup>T<sub>E</sub>X

L<sup>A</sup>T<sub>E</sub>X is evolving to become a better product. The intermediate extended version was initially called L<sup>A</sup>T<sub>E</sub>X2e but now has reverted back to just L<sup>A</sup>T<sub>E</sub>X (and the older version is now called L<sup>A</sup>T<sub>E</sub>X2.09), and it is a step towards L<sup>A</sup>T<sub>E</sub>X3. You can read about this in the second edition of Lamport's book [Lamp 84] and in *The L<sup>A</sup>T<sub>E</sub>X Companion* [9]. The old L<sup>A</sup>T<sub>E</sub>X2.09 `\documentstyle` command is replaced by `\documentclass` but older latex files run with legacy code. Also because I am using two overlapping bibliographies to show the two different styles, some citations will come out in each of the two styles, and a warning will appear when latexing the document of multiple label definition for those cross-references that overlap.

## References

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## References

- [Org 89] Orgot, I.F. *LaTeX for Scientists and Engineers*, Addison-Wesley, New York, 1989. <sup>1</sup>
- [Lamp 84] Lamport, L., *The LaTeX Document Preparation System*, Addison-Wesley, New York, 1984; Second Edition: 1994.
- [Hahn 91] Hahn, J., *LaTeX For Everyone*, Personal Tex, Inc, Mill Valley, California, 1991.
- [Jant 90] Jantzen, B., *This Document*, 1990.
- [MTW 73] Misner, C.W., Thorne, K.S., and Wheeler, J.A.W., *Gravitation*, W.H. Freeman, New York, 1973.

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<sup>1</sup>If I had interchanged the order of these two bibliographies, the numbers of the previous list would have appeared in the text instead of the optional alphanumeric tags of this one, since the last definitions made are the ones which are used. Note that you have to `LaTeX` twice to get cross-references right.