\textbf{\LaTeX{} for Beginners}

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Brandeis University
September 20, 2018
What is typesetting?

How typesetting differs from wordprocessing

- **Justification by paragraph, not by line**
- ligatures: ff, fl, fi, ffi, ct, st, sp italic: as, ch, ck, sh, sch, ng, nd, ll
- kerning VA AC FA OA
- hyphen, en-dash, em-dash, minus sign
- font design size vs. optical size
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Advantages of typesetting

- camera ready pdf output
- saves time and money
- eliminates some sources of error
- author has fine control over book design
- sources in ASCII
- sources a record of author’s typographic intentions
- complex tasks can be automated, e.g. “Notes to pp. xx–yy”
- multilingual hyphenation
- makes nice slides
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WYSIWYG vs. Compiled typesetting

- exact rendering via description vs approximate placement by mouse
- almost infinite extensibility
  - running headers
  - stanza at page turn
  - first section title
- separation of content from typesetting e.g. “chapter” “section” “stanza” “poemtitle”
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What you need to begin

1. **A text editor**
   - for Windows: TeXnicCenter, WinEDT
   - for OSX: TeXshop, Aquamacs, AlphaX
   - for unix: emacs+auctex

2. **A \TeX{} installation**
   - for Windows: proTeXt, Personal TeX, BaKoMa, TeXlive
   - for OSX: TeXLive, CMacTeX, OzTeX
     [http://www.tug.org/mactex/](http://www.tug.org/mactex/)
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WYSIWYG tools

- for Windows: Lyx
- for OSX: Lyx, TeXniscope, Flashmode
- for unix: Lyx
Where to get it?

- **software**: Comprehensive T\TeX\ Archive Network, http://ctan.tug.org (also loads of style packages, fonts, tools, and so on)
- **help**: T\TeX\ User’s Group http://www.tug.org (Getting Started, FAQ), newsgroup: comp.text.tex (specific questions)
Local Help

1. Check out the local \TeX\ website at http://lts.unet.brandeis.edu/research/tools/tex.html
2. Ask to join the Brandeis-Boston \TeX\ User Group mailing list: https://lists.brandeis.edu/wws/subrequest/TeX
3. Ask me by emailing me at texlatex@brandeis.edu
Basic formatting commands

“Emphasized text is marked with \emph{to show that it is something important} (with italic correction).”

Text can also be \textbf{bold}, \textsc{small caps} \textsf{in sanserif fonts} or {\large in} {\Large various} {\small sizes}.

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Text can also be \textbf{bold} \textsc{small caps} \textsf{in sanserif fonts} or \textbf{in various} sizes.
Some Accented Characters

Accents use backslashes: na\"\{i\}ve, resum\’{e}, a\~{n}os

Accents use backslashes: naïve, resumé, años
Some Special Characters

<table>
<thead>
<tr>
<th>To type</th>
<th>Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>{</td>
<td>{</td>
</tr>
<tr>
<td>}</td>
<td>}</td>
</tr>
<tr>
<td>~</td>
<td>~{}</td>
</tr>
<tr>
<td>...</td>
<td>\ldots</td>
</tr>
<tr>
<td>^</td>
<td>^{}</td>
</tr>
</tbody>
</table>
Environments

\begin{enumerate}
\item First item
\item Second item
\item Third item
\end{enumerate}

1. First item
2. Second item
3. Third item

Other common environments: itemize, verse, quotation, center, tabular, verbatim.
The Verse Environment

\begin{verse}
There is an environment
  for verse \\
Whose features some poets
will curse.

For instead of making\\
Them do \textit{all} line breaking, \\
It allows them to put too many words
on a line when they’d rather be
forced to be terse.
\end{verse}
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There is an environment for verse
Whose features some poets will curse.

For instead of making
Them do all line breaking,
It allows them to put too many words on a line
when they’d rather be forced to be terse.
Footnotes, endnotes, marginal notes

- `\footnote{footnote text}`
- `\endnote{endnote text}`
- `\marginpar{marginal note}`
Making Tables: Placing the Table

\begin{table}[htbp]
\caption{default}
\begin{tabular}{|c|c|}
\end{tabular}
\label{tab:example}
\end{table}

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\end{tabular}

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\end{table}
Making Tables: Table Contents

\begin{tabular}{|l|l|}
\hline
Item & Amount \\
\hline
One line in a table & \$109/day = \$ 1635 \\
Another line & \$400 \\
Third \$15/hr & \$450 \\
\hline
TOTAL & \$2485 \\
\hline
\end{tabular}

Field specification
& separates columns \$ for special character
\\ separates rows
Making Tables: Table Contents

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## Table Output

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<thead>
<tr>
<th>Item</th>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
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<td>$400</td>
</tr>
<tr>
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<td>$450</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$2485</td>
</tr>
</tbody>
</table>
**Mathematics**

\texttt{\LaTeX} has no equal for typesetting mathematics:

$$\int_a^b f(x) \, dx = \lim_{n \to \infty} \sum_{k=0}^{n-1} f(x_k) \Delta x$$

yields the following:

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\begin{equation}
\int_a^b f(x) \, dx = \lim_{n \to \infty} \sum_{k=0}^{n-1} f(x_k) \Delta x
\end{equation}

yields the following:

\[
\int_{a}^{b} f(x) \, dx = \lim_{n \to \infty} \sum_{k=0}^{n-1} f(x_k) \Delta x
\]
Kinds of Math Display

- **Inline** $...$ or \((...\))
- **Displayed Numbered Equations** \begin{equation}
- **Displayed Unnumbered Equations** \begin{equation*}
- **Equation Groups** \begin{align}
20/45
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Math Structures

• **Greek Letters:** $\theta$, $\Gamma$

• **Subscripts and Superscripts:** $x_1$, $y^2$

• **Integrals**

$$\int_{0}^{\infty} t^{\alpha-1} e^{-t} \, dt$$
Math Structures

- **Greek Letters:** \( \text{\textbackslash theta} \) \( \theta \), \( \text{\textbackslash Gamma} \) \( \Gamma \)
- **Subscripts and Superscripts:** \( \text{x\_\_1} \) \( x_1 \), \( \text{y\^\_2} \) \( y^2 \)
- **Integrals**
  \( \int_{0}^{\infty} t^{\alpha-1} e^{-t} \, \text{d}t \)
Math Structures

- **Greek Letters:** $\theta$, $\Gamma$
- **Subscripts and Superscripts:** $x_1$, $y^2$
- **Integrals**
  \[
b \int_0^\infty t^{\alpha-1} e^{-t} \, dt\]
\begin{equation}
\frac{\text{numerator}}{\text{denominator}}
\end{equation}

\text{numerator} \quad \frac{\text{numerator}}{\text{denominator}} \quad \text{denominator} 

(1)
Other Math Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Command</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar</td>
<td>$\bar{x}$</td>
<td>$\bar{x}$</td>
</tr>
<tr>
<td>Tilde</td>
<td>$\tilde{\theta}$</td>
<td>$\tilde{\theta}$</td>
</tr>
<tr>
<td>Hat</td>
<td>$\hat{\beta}$</td>
<td>$\hat{\beta}$</td>
</tr>
<tr>
<td>Square Root</td>
<td>$\sqrt{4}$</td>
<td>$\sqrt{4}$</td>
</tr>
<tr>
<td>Infinity</td>
<td>$\infty$</td>
<td>$\infty$</td>
</tr>
<tr>
<td>Inequalities</td>
<td>$\leq$, $\geq$</td>
<td>$\leq$, $\geq$</td>
</tr>
<tr>
<td>Right Arrow</td>
<td>$\rightarrow$</td>
<td>$\rightarrow$</td>
</tr>
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## Sines, Cosines, etc.

<table>
<thead>
<tr>
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<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\exp{-x}$</td>
<td>exp $-x$</td>
</tr>
<tr>
<td>$\lim_{x \to 0}$</td>
<td>lim$_{x \to 0}$</td>
</tr>
<tr>
<td>$\Pr(x=1)$</td>
<td>Pr($x = 1$)</td>
</tr>
<tr>
<td>$\max(i,j)$</td>
<td>max($i, j$)</td>
</tr>
<tr>
<td>$\sin(\pi)$</td>
<td>sin($\pi$)</td>
</tr>
</tbody>
</table>

$$\frac{24}{45}$$
Matrices

\begin{matrix}
a & b \\ c & d
\end{matrix}
You mark out the structural elements, \LaTeX sets them: First, the \textit{preamble}

\begin{verbatim}
\documentclass[12pt]{article}
\usepackage{chicago}
\usepackage{times,geometry,makeidx,multicol}
\geometry{left=1in,right=1in,
top=1in,bottom=1in}
\title{Lincoln’s Peoria Speech of 1854}
\author{John Burt}\date{\today}
\pagestyle{myheadings}
\markboth{Lincoln’s Peoria Speech}{Lincoln’s Peoria Speech}
\makeindex
\end{verbatim}
Document Classes and Document Structure

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Then the \textit{body}

\begin{document}
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\tableofcontents
\section{The problem of extreme moral conflict}
blah\index{Federalist@\textit{The Federalist}}.

Blank lines start new paragraphs.
blah\cite{Douglas1854}
\section{The irony of American History}
blah blah blah blah\footnote{footnote text}
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\section{The problem of extreme moral conflict}
blah\index{Federalist\emph{The Federalist}}.

Blank lines start new paragraphs.
blah\cite{Douglas1854}
\section{The irony of American History}
blah blah blah blah\footnote{footnote text}
Document Classes and Document Structure

Then the *ending*

```latex
\bibliographystyle{chicago}
\bibliography{lincoln}
\printindex
\end{document}
```
Document Classes and Document Structure

Then the **ending**

```
\bibliographystyle{chicago}
\bibliography{lincoln}
\printindex
\end{document}
```
Document Classes and Document Structure

Then the *ending*

\bibliographystyle{chicago}
\bibliography{lincoln}
\printindex
\end{document}
Document Classes and Document Structure

Then the *ending*

\bibliographystyle{chicago}
\bibliography{lincoln}
\printindex
\end{document}
Class and Style Files

Thousands of style files are available at CTAN for special purposes such as chemical formulas, Feynmann diagrams, recipe books, slides, or business cards.

Class files are available for kinds of documents: letters, CVs, music.
Multiple Languages

\LaTeX\ will follow the hyphenation rules of any language, and will adjust the names of “Chapter” or “Bibliography” to suit the language.

\usepackage[german,italian]{babel}
\selectlanguage{german}
\iflanguage{language}{iftrue}{iffalse}
New Commands

- \newcommand{\name}[narg]{\texttt{command}}
  \newcommand{\dumb}[2]{\textit{#1} \textsc{#2}}
  \texttt{this is dumb \textsc{#2}}

- \renewcommand{\dumb}[2]{\textit{#1} \textsc{#2}}
  \texttt{this is dumb \textsc{#2}}

- \providecommand{\dumb}[2]{\textit{#1} \textsc{#2}}
  \texttt{this is dumb \textsc{#2}}

- \newenvironment{\name}[narg]{\texttt{begindef}}{\texttt{enddef}}
New Commands

- \newcommand{\name}[narg]{command}
- \newcommand{\dumb}[2]{\textit{#1} this is dumb \textsc{#2}}
- \renewcommand{\dumb}[2]{\textit{#1} this is dumb \textsc{#2}}
- \providecommand{\dumb}[2]{\textit{#1} this is dumb \textsc{#2}}
- \newenvironment{\name}[narg]{begindef}{enddef}
New Commands

- \newcommand{\name}[narg]{command}
  \newcommand{\dumb}[2]{\textit{#1}
  this is dumb \textsc{#2}}

- \renewcommand{\dumb}[2]{\textit{#1}
  this is dumb \textsc{#2}}
  \providecommand{\dumb}[2]{\textit{#1}
  this is dumb \textsc{#2}}

- \newenvironment{name}[narg]{\begin{def}}{\end{def}
New Commands

Wow, Charlie Brown,
\texttt{\texttt{dumb} \texttt{text}} \texttt{\texttt{dumber text}}

Wow, Charlie Brown, \textit{dumb text} this is dumb DUMBER TEXT
New Commands

Wow, Charlie Brown, \dumb\{dumb text\}\{dumber text\}

Wow, Charlie Brown, \textit{dumb text} this is dumb DUMBER TEXT
Cross References

Place \label{some unique text} at some point in the text you wish to refer to.
\ref{some unique text} will typeset the chapter number, section number, figure number (or whatever) of where the label was placed.
\pageref{some unique text} will typeset the page number.

As I said in chapter \ref{some unique label} (page \pageref{some unique label}).
will yield “As I said in chapter 4 (page 27).”
Cross References

Place \label{some unique text} at some point in the text you wish to refer to.
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will yield “As I said in chapter 4 (page 27).”
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As I said in chapter \ref{some unique label} (page \pageref{some unique label}).

will yield “As I said in chapter 4 (page 27).”
\LaTeX{} has many built in counters, for chapter number, section number, and so on. You can define your own using \texttt{\newcounter}. If you add or rearrange material, \LaTeX{} will keep all the numbers straight.
Example Counter

From `chemno.sty`:

```
\newcounter{chemnum}
\newwrite\chem@out
\immediate\openout\chem@out\jobname.chemno
\def\chemno#1{\refstepcounter{chemnum}%
  \label{#1}\immediate\write\chem@out%
  \textbf{\thechemnum}{#1}{\thepage}}}%
\def\cref#1{\textbf{\ref{#1}}}
```

Thanks to Toby Sommer.
Usage of chemno

This input:

Ketone \texttt{\chemno{ketoneA}} was coupled with previously prepared bromide \texttt{\chemno{vinylbromide}}
(Scheme \ref{bromoprep})
to produce the desired allylic alcohol \texttt{\chemno{allylalcAB}}

Yields this output:

Ketone 22 was coupled with previously prepared bromide 6 (Scheme 2) to produce the desired allylic alcohol 28.
Index Workflow

1. add \makeidx to package list, add \makeindex to preamble, write \printindex where you wish to place the index

2. mark entries in main text

3. run \LaTeX to generate raw .idx file

4. run MakeIndex (or Xindy) to generate .ind file (sorted, formatted index)

5. run \LaTeX again to incorporate index
Index Workflow

1. add `makeidx` to package list, add `\makeindex` to preamble, write `\printindex` where you wish to place the index

2. mark entries in main text

3. run \LaTeX{} to generate raw \texttt{.idx} file

4. run MakeIndex (or Xindy) to generate \texttt{.ind} file (sorted, formatted index)

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Generating an Index

• **simple entry**
  \index{Prelude}

• **appearance of entry**
  \index{Prelude@\emph{The Prelude}}

• **subentries**
  \index{Prelude!visions!Dream of the Arab}

• **page ranges**
  at beginning: \index{table|()}
  at end: \index{table|())

• **“see”**: \index{table|see{furniture, table}}
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  at end: \index{table|)}

- **“see”**:
  \index{table|see{furniture, table}}
Making an Index from Galleys

To make an index from somebody else’s galleys create the .idx intermediate file:

- \indexentry{animal}\{5\
- \indexentry{animal@\emph{animal}}\{5\
- \indexentry{animal!cat}\{5\

Run MakeIndex to generate the .ind file, then read it in to a dummy file with \printindex.
Bibliography Workflow

1. Prepare a .bib database
   BibTeX or biber will select entries for works you cite in your text, and format them according to the format you choose.

2. Mark inline citations in main text
   Some bibliographic styles require a style file in the preamble too

3. Run \LaTeX{} to generate an .aux file

4. Run BibTeX to generate a .bbl file (sorted formatted bibliography)

5. Run \LaTeX{} twice more to input bibliography and cross references
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The .bib Database

@book{Ahlstrom1972,
    author = {Ahlstrom, Sydney E.},
    title = {A Religious History of the American People},
    address = {New Haven},
    publisher = {Yale University Press},
    year = 1972,
}
A more complex .bib entry

@inCollection{Brandwood1992,
  author = {Brandwood, Leonard},
  title = {Stylometry and Chronology},
  booktitle = {The Cambridge Companion to Plato},
  address = {New York},
  publisher = {Cambridge University Press},
  year = 1992,
  crossref = {Kraut1992},
}
Using a Bibliography

- for the preamble:
  \usepackage{chicago}

- inline citation in the body:
  \cite{Ahlstrom1972}

- no inline citation in the body:
  \nocite{Ahlstrom1972}
Printing the Bibliography

To put where you wish the bibliography to appear:

- **specify the style:**
  \bibliographystyle{chicago}

- **select cited entries from lincoln.bib and typeset them here:**
  \bibliography{lincoln}
Further Reading


- Donald Knuth, *The TeXbook*, Addison Wesley 1984 ISBN 0201134489 (Despite the date, the absolutely crucial book. Knuth is the author of TeX.)