

L^AT_EX – A pragmatic approach to typesetting your thesis

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Outline

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Introduction – Preliminaries

- ▶ The preamble
- ▶ The $\text{T}_\text{E}\text{X}$ -document
- ▶ Dispositions

Protip

Be careful with pushing up your thesis too much. Try too keep the style clean, classic and tasteful!

The preamble

- ▶ Where the document format and global packages and commands are imported and defined.
- ▶ Everything before `'\begin{document}'`.
- ▶ Custom commands may be defined here.

```
%Document format
\documentclass[11pt, a4paper,
               twoside, titlepage]{book}
\usepackage[latin1]{inputenc}
%Maths
\usepackage{amsmath,
            amsfonts,
            amssymb,
            amsthm, mathtools}

%Figures
\usepackage{graphicx} %Graphics
\usepackage[center]{caption}
\usepackage{subcaption}
\usepackage{wrapfig}
\usepackage{float}
. . .
```

The main T_EX-document

- ▶ The .tex-file which contains 'everything', and most importantly your thesis.
- ▶ Text can be written directly here or imported with the '\include{ }'-command.
- ▶ The hierarchy shown here should be employed:

```
\chapter{...}  
\section{...}  
\subsection{...}  
\subsubsection{...}  
%Unnumbered:  
\subsection*{...}
```

Disposition of thesis I

I

Introduction. Briefly describe the history and current state of knowledge of your field. Motivate your study and describe your angle of attack. Mention important results. Finally, give a summary of the outline of the thesis.

II

Background. Extensively describe the components involved in your thesis; both general and on a more basic level. This must be well referenced and backed up by the literature. Try to include as many new studies as possible, as it shows that you are on par with the current knowledge.

III

Methods. Your approach to the problem. You may describe how your methods differ from other approaches here.

Disposition of thesis II

IV

Theoretical model. If you have developed or you are using a theoretical model, e.g. in simulations or other considerations, discuss them here. For purely theoretical studies, this is your most important chapter and it will normally overlap with the methodology description. Derivations may be presented here.

V

Results. Present and thoroughly describe your findings.

VI

Discussion. Discuss your findings. Assess the successfulness of your approach. Discuss how your work contributes to the current literature.

VII

Conclusions

Problem

Import a package which produces dummy text, and use this to produce a few paragraphs.

Vary the style and size of the text.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Referencing

- ▶ Backing up your work with references to other peer reviewed studies is the most important step in ensuring its credibility.
- ▶ Internal referencing and citing external works will be presented here.

Havnes, O., Trøim, J., Blix, T., Mortensen, W., Næsheim, L. I., Thrane, E., and Tønnesen, T. First detection of charged dust particles in the Earth's mesosphere. *Journal of Geophysical Research: Space Physics*, 101(A5): 10839–10847, 1996. ISSN 2156-2202. doi: 10.1029/96JA00003.

Figure 1 : Example of a properly formatted entry in the bibliography.

Internal references

- ▶ All internal references are named with the **label**-command.
- ▶ Practical when summarizing what e.g. a chapter discusses.
- ▶ Equations are cited differently than figures and sections etc.!

```
%Label :  
\label{REF1}
```

```
%Figures, Chpts, tabs etc.  
\ref{REF1}
```

```
%Equations  
\eqref{REF1}
```

A proper bibliography – Getting started

- ▶ We combine **natbib** with **BibTeX** to get the best result. A few prerequisites to handle this are merely a few lines of code.
- ▶ This combination is highly customizable, and a custom style for a typical thesis is made for this course.
- ▶ To compile: $\text{\LaTeX} \rightarrow \text{BibTeX} \rightarrow \text{\LaTeX} \rightarrow \text{\LaTeX}$

```
%In the preamble:  
\usepackage[authoryear,  
square]{natbib}  
  
%Before \end{document}  
\bibliographystyle{  
Template_LastNameFirst...  
_Alphabetical}  
  
\bibliography  
{database_template}
```

A proper bibliography – Style and preferences

- ▶ The style of citations is specified in the preamble, as shown previously. The style of the bibliography can be a bit trickier. To avoid using time on this issue, use the customized style made for this course named "Template_LastNameFirst_Alphabetical.bst". This will sort the entries alphabetically after the last name of the first author.

```
%Add right before \end{document}:  
\bibliographystyle{.../Template_LastNameFirst_Alphabetical}  
\bibliography{.../database_template}
```

A proper bibliography – The database file

- ▶ All references are stored in a .bib file (a text file). The simplest modification of this file is to paste new entries directly into it. Special software may also be used for this purpose.
- ▶ An example file named "database_template.bib" is included here.
- ▶ Some common reference types are 'article', 'phdthesis', 'inproceedings' and 'book'.

Protip

Where possible, always use the primary source in your references. Try to avoid using secondary and tertiary sources; webpages, 'references therein' etc.

A proper bibliography – A database entry

```
@article {havnes96,  
author = {Havnes, O. and Tr{\o}im, J. and Blix,  
          T. and Mortensen, W. and N{\ae}sheim,  
          L. I. and Thrane, E. and T{\o}nnesen, T.},  
title = {First detection of charged dust  
particles in the {E}arth's mesosphere},  
journal = {Journal of Geophysical Research:  
           Space Physics},  
volume = {101},  
number = {A5},  
issn = {2156-2202},  
doi = {10.1029/96JA00003},  
pages = {10839--10847},  
year = {1996},  
}
```

A proper bibliography – Using the database

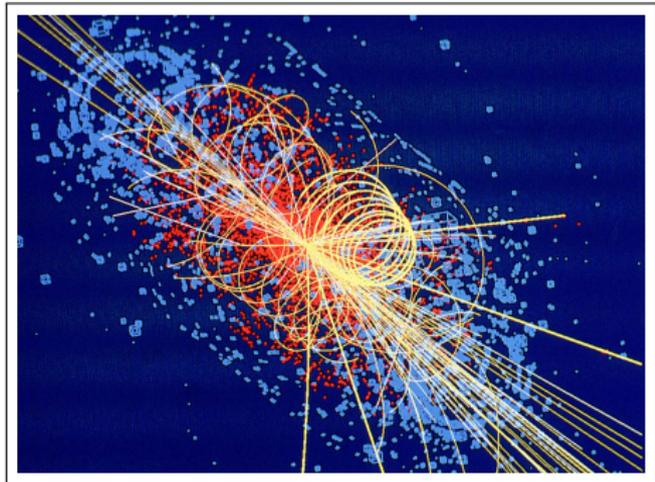
- ▶ There are two main ways to cite a work with **natbib**:
 - ▶ `\citet{...}` produces the normal format, i.e. Someone et al. (2008).
 - ▶ `\citep{...}` produces the citation in parenthesis, i.e. (Someone et al., 2008).
- ▶ Other citation commands can be found in the online documentation.

Protip

A typical bibliography entry is at least a couple of hundred characters long. In other words, you will save a lot of time importing the references from the publisher online as compared to manually punching them into you database.

Problem

Find the article '*Broken Symmetries and the Masses of Gauge Bosons*' online, export the citation and use it with different styles!



Typesetting plain text and equations

The main treatment of these subjects is left to the compendium.

Protip

Always look for macros or packages to simplify the typesetting of text or maths you use a lot. Packages made especially for typesetting e.g. quantum physics exist.

Plain text

- ▶ The main concern in text formatting with L^AT_EX, is the style of the text it self (weight, font, size etc.). Some common commands are given in the box on the right.
- ▶ The layout takes care of itself (most often).
- ▶ WikiBook entry: http://en.wikibooks.org/wiki/LaTeX/Text_Formatting.

```
%Bold (Text/Math-mode):  
\textbf{} / \mathbf{}  
%Emphasized  
\emph{}  
%Suppress indent  
\noindent  
%Local text size  
{\tiny ...} {\Huge} etc.  
%Underlined  
\underline{...}  
%Arrow vector (Math-m.)  
\vec{...}
```

Equations

- ▶ General equation typesetting is handled in the compendium with an extended example; check it out.
- ▶ As one gains experience, the time spent on typesetting equations will decay exponentially.
- ▶ *Mathematica* can save you a lot of time, because of its fast shortcuts.
- ▶ Useful WikiBook entry:
<http://en.wikibooks.org/wiki/LaTeX/Mathematics>.

Protip

Vectors are defined by default with arrows. If you want bold vectors, a custom macro or package must be used.

Problem

Typeset the following equations:

$$\underbrace{\pi r_d^2 n_g v_{th,g} \cdot k_B T_g}_{P_N} = \frac{4\pi}{3} \rho_d r_d^3 c_p \frac{dT_d}{dt} + L_d \frac{dm_d}{dt} \quad (1)$$

$$\frac{dT_d}{dt} = \left(\hat{P} - L_d \frac{dm_d}{dt} \right) / \frac{4\pi}{3} \rho_d r_d^3 c_p \quad (2)$$

$$\begin{aligned} \vec{F}_{drag} = \pi r_d^2 m_g n_g v_{th,g} (\vec{v}_g - \vec{v}_d) \frac{1}{u} & \left\{ \frac{1}{\sqrt{\pi}} \left(u + \frac{1}{2u} \right) \exp(-u^2) \right. \\ & \left. + \left(1 + u^2 - \frac{1}{4u^2} \right) \operatorname{erf}(u) \right\} \end{aligned} \quad (3)$$

Figures and Tables

- ▶ Like in equation typesetting, the environments for figures and tables are many.
- ▶ We treat the topic with help from the compendium.
- ▶ Floats and format are topics to note!
- ▶ Matlab can be used to export decent looking figures.

Figures – A typical entry

The commands `\usepackage{graphics}` and `\usepackage{float}` should be specified in the preamble. The following command set typesets a figure:

```
\begin{figure}  
\includegraphics [width=\textwidth]{.../filename}  
\caption{\label{fig:your-figure}Caption goes here.}  
\end{figure}
```

Tables

- ▶ The placement of a table is identical to figure placement. Note that the caption should be above.
- ▶ Use the `tabular`-environment.
- ▶ Matlab can be also be used to export tables.
- ▶ Tables can contain graphical objects.

TikZ

- ▶ TikZ is an option to make in document vector graphics.
- ▶ Super nice and often super frustrating.
- ▶ Makes your figures fitting for even the most prestigious journals, if used correctly.
- ▶ See the compendium for a few examples.

Protip

Using TikZ will most likely cause death.

Problem

Make a table, import an image and typeset them corresponding to proper formatting.

