An introduction to LaTeX

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When NOT to use LaTeX

- For small documents, letters

Main features and strengths

- Professional type-setting
- Focus on document structure, not type-setting
- Mathematical formulae
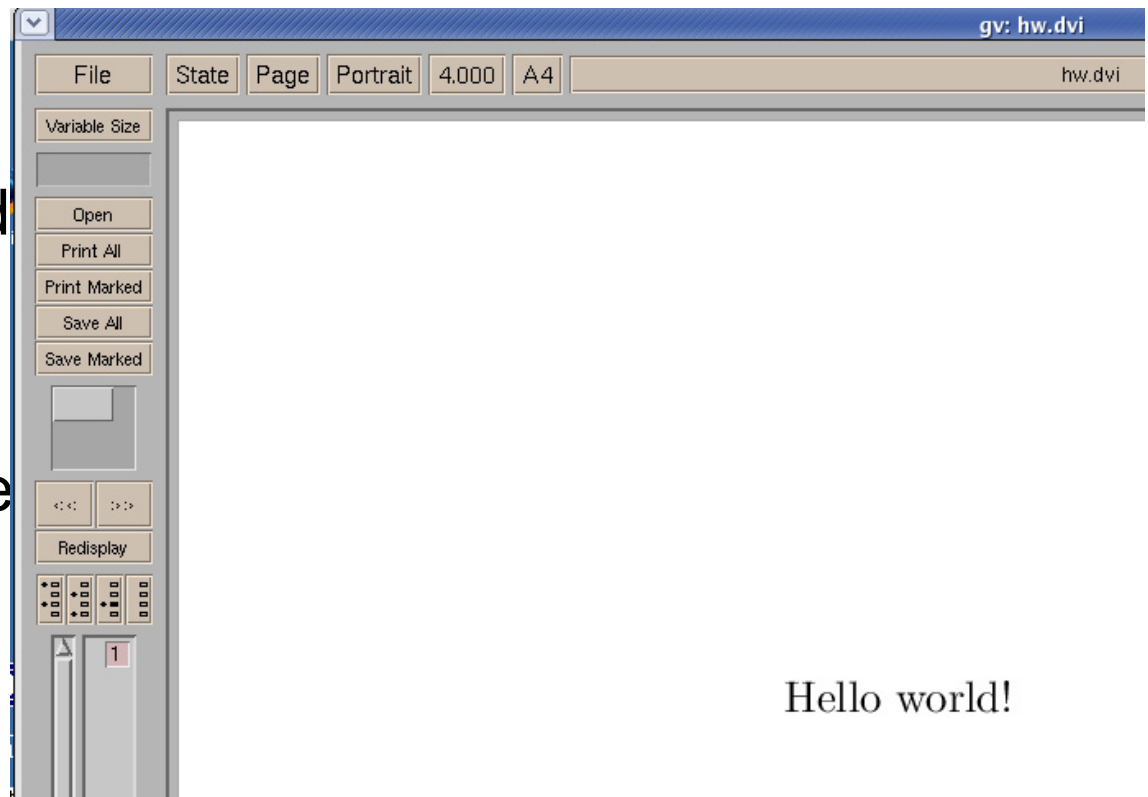- Good control over spacing, absolute positioning

Hello world!

```
\documentclass[a4paper]{article}
\begin{document}
Hello world!
\end{document}
```

On command line, d

$ latex file.tex

$ dvips –o file.ps file

$ gv file.ps &

Hello world!

First basics

- LaTeX does not consider more than one space, or more than one blank line
- Special characters `$ & % # _ { } ~ ^ \` should be backslashed: `\$`
- All commands are with `\`, e.g. `\newline`
- `\\` (or `\newline`) gives a new line
- Comments are given with `%`
- Use editor that supports syntax highlighting, such as emacs, vi, nedit, etc.

More basics

- Spacing: use `~` for 'unbreakable space', e.g., in `Figure~1,` or in '`i.e.~there`'.

  Used in Figure and Table numbers, citations.

- Dashes:

daughter-in-law, X-rated
pages 13–67
yes—or no?
0, 1 and −1

```
daughter-in-law, X-rated\\
pages 13--67\\
yes---or no? \\
$0$, $1$ and $-1$
```

Fonts

- ## Font styles:

`\textrm{...}`	roman	`\textsf{...}`	sans serif
`\texttt{...}`	typewriter	`\textbf{...}`	**bold face**
`\textmd{...}`	medium		
`\textup{...}`	upright	`\textit{...}`	*italic*
`\textsl{...}`	*slanted*	`\textsc{...}`	SMALL CAPS
`\emph{...}`	*emphasised*	`\textnormal{...}`	document font

- ## Font sizes:

`\tiny`	tiny font	`\Large`	larger font
`\scriptsize`	very small font	`\LARGE`	very large font
`\footnotesize`	quite small font	`\huge`	huge
`\small`	small font	`\Huge`	largest
`\normalsize`	normal font		
`\large`	large font		

Hyphenation:

I think this is: supercalifragilisticexpialidocious

```
I think this is: su\-per\-cal\-%
i\-frag\-i\-lis\-tic\-ex\-pi\-%
al\-i\-do\-cious
```

Footnotes:

Footnotes[a] are often used by people using LATEX.

———————
[a]This is a footnote

```
Footnotes\footnote{This
  is a footnote} are often used
by people using \LaTeX.
```

References:

A reference to this subsection looks like: "see section 2.6 on page 20."

```
A reference to this subsection
\label{sec:this} looks like:
``see section~\ref{sec:this} on
page~\pageref{sec:this}.''
```

The preamble

- Specify document defaults:
- Include extra packages with `\usepackage{packagename}`
- Set page size (if default is not OK), main font
- Create new commands and macros
- Set title and author: `\title{} \author{}`
- Create title & author with `\maketitle` right after `\begin{document}`

Document classes

- **Choose class:** `article, book, report, slides, amsart, …`

- **Choose headings style:** `plain, headings, empty`

- **Choose font size, paper size (** `a4paper, letterpaper, …)`

- **Choose** `twocolumn` **output (or not)**

```
\documentclass[a4paper,12pt,headings]{article}
```

Document structure

To start a new chapter, do

    `\chapter{chaptertitle}` (only for book style)

And so on, for `section, subsection, subsubssection, paragraph, appendix`

To get unnumbered sections etc, use

    `\section*{sectiontitle}`

To make TOC: `\tableofcontents` right after

    `\begin{document}`

Environments

- `\begin{name} … \end{name}`

- **Lists:** `itemize, enumerate, description`

- `\begin{displaymath} … \end{displaymath}` **or** `\[ …\]`

- **Plenty of maths environments**

- **Text alignment:** `flushleft, flushright, center, quote, verse`

1. You can mix the list environments to your taste:

   - But it might start to look silly.
   - If you over-do it.

2. Therefore remember:

   Stupid things will not become smart because they are in a list.

   Smart things though, can be presented beautifully in a list.

```
\begin{enumerate}
\item You can mix the list
environments to your taste:
\begin{itemize}
\item But it might start to
look silly.
\item If you over-do it.
\end{itemize}
\item Therefore remember:
\begin{description}
\item[Stupid] things will not
become smart because they are
in a list.
\item[Smart] things though, can be
presented beautifully in a list.
\end{description}
\end{enumerate}
```

This text is
left aligned. LATEX is not trying to
make each line the same length.

```
\begin{flushleft}
This text is\\ left aligned.
\LaTeX{} is not trying to make
each line the same length.
\end{flushleft}
```

This text is right
aligned. LATEX is not trying to make
each line the same length.

```
\begin{flushright}
This text is right\\ aligned.
\LaTeX{} is not trying to make
each line the same length.
\end{flushright}
```

Tables

7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

```
\begin{tabular}{|r|l|}
\hline
7C0 & hexadecimal \\
3700 & octal \\
11111000000 & binary \\
\hline \hline
1984 & decimal \\
\hline
\end{tabular}
```

Pi expression	Value
π	3.1416
π^{π}	36.46
$(\pi^{\pi})^{\pi}$	80662.7

```
\begin{tabular}{c r @{.} l}
Pi expression          &
\multicolumn{2}{c}{Value} \\
\hline
$\pi$                  & 3&1416  \\
$\pi^{\pi}$            & 36&46   \\
$(\pi^{\pi})^{\pi}$ & 80662&7 \\
\end{tabular}
```

Floats

- Figures and Tables are floats
- Start a new float with `\begin{table}[!hbp]`
- Determine placement with

h   *here* at the very place in the text where it occurred. This is useful mainly for small floats.

t   at the *top* of a page

b   at the *bottom* of a page

p   on a special *page* containing only floats.

!   without considering most of the internal parameters[a] which could stop this float from being placed.

Example float

```
Figure~\ref{white} is an example of Pop-Art.
\begin{figure}[!hbp]
\makebox[\textwidth]{\framebox[5cm]{\rule{0pt}{5cm}}}
\caption{Five by Five in Centimetres} \label{white}
\end{figure}
```

Note order of `\caption{}` and `\label{}`

More common usage: including pic1.eps

```
\begin{figure}[!htbp]
\includegraphics[width=12cm]{pic1}
\caption{…}\label{fig:pic1}
\end{figure}
```

New commands

- **Simple:**

"The not so Short Introduction to LATEX 2_ε" ... "The not so Short Introduction to LATEX 2_ε"

```
\newcommand{\tnss}
    {The not so Short Introduction
        to \LaTeXe}
% in the document body :
``\tnss'' \ldots{} ``\tnss''
```

- **With argument:**

- The *not so* Short Introduction to LATEX 2_ε

- The *very* Short Introduction to LATEX 2_ε

```
\newcommand{\txsit}[1]
    {The \emph{#1} Short
        Introduction to \LaTeXe}
% in the document body:
\begin{itemize}
\item \txsit{not so}
\item \txsit{very}
\end{itemize}
```

Mathematics basics

Add a squared and b squared to get c squared. Or using a more mathematical approach: $c^2 = a^2 + b^2$

```
Add $a$ squared and $b$ squared
to get $c$ squared. Or using
a more mathematical approach:
$c^{2}=a^{2}+b^{2}$
```

$$\epsilon > 0 \qquad (3.1)$$

From (3.1) we gather …

```
\begin{equation} \label{eq:eps}
\epsilon > 0
\end{equation}
From (\ref{eq:eps}) we gather
\ldots
```

$$x^2 \geq 0 \qquad \textrm{for all } x \in \mathbf{R} \qquad (3.3)$$

```
\begin{equation}
x^{2} \geq 0\qquad
\textrm{for all }x\in\mathbf{R}
\end{equation}
```

Maths basics 2

a_1 x^2 $e^{-\alpha t}$ a^3_{ij}

$e^{x^2} \neq e^{x2}$

```
$a_{1}$ \qquad $x^{2}$ \qquad
$e^{-\alpha t}$ \qquad
$a^{3}_{ij}$\\
$e^{x^2} \neq {e^x}^2$
```

$\sqrt{x}$ $\sqrt{x^2 + \sqrt{y}}$ $\sqrt[3]{2}$

```
$\sqrt{x}$ \qquad
$\sqrt{ x^{2}+\sqrt{y} }$
\qquad $\sqrt[3]{2}$
```

$\overline{m+n}$

```
$\overline{m+n}$
```

$\underbrace{a + b + \cdots + z}_{26}$

```
$\underbrace{ a+b+\cdots+z }_{26}$
```

$\lim_{n \to 0} \dfrac{\sin x}{x} = 1$

```
\[\lim_{n \rightarrow 0}
\frac{\sin x}{x}=1\]
```

More maths

$$\sum_{i=1}^{n} \qquad \int_{0}^{\frac{\pi}{2}}$$

```
\begin{displaymath}
\sum_{i=1}^{n} \qquad
\int_{0}^{\frac{\pi}{2}} \qquad
\end{displaymath}
```

$$\iint_{D} dx\,dy \quad \text{instead of} \quad \int \int_{D} dxdy$$

```
\begin{displaymath}
\int\!\!\!\int_{D} dx\,dy \quad
\textrm{instead of} \quad
\int\int_{D} dx dy
\end{displaymath}
```

$$\Big((x+1)(x-1) \Big)^{2}$$

$$\left(\left(\left(\Big(\quad \}\}\}\right) \right. \quad \| \| \| \| \|$$

```
$\Big( (x+1) (x-1) \Big) ^{2}$\\
$\big(\Big(\bigg(\Bigg($\quad
$\big\}\Big\}\bigg\}\Bigg\}$\quad
$\big\|\Big\|\bigg\|\Bigg\|$
```

Matrices and co.

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \cdots \\ x_{21} & x_{22} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

```
\begin{displaymath}
\mathbf{X} =
\left( \begin{array}{ccc}
x_{11} & x_{12} & \ldots \\
x_{21} & x_{22} & \ldots \\
\vdots & \vdots & \ddots
\end{array} \right)
\end{displaymath}
```

$$y = \begin{cases} a & \text{if } d > c \\ b + x & \text{in the morning} \\ l & \text{all day long} \end{cases}$$

```
\begin{displaymath}
y = \left\{ \begin{array}{ll}
 a & \textrm{if $d>c$}\\
 b+x & \textrm{in the morning}\\
 l & \textrm{all day long}
  \end{array} \right.
\end{displaymath}
```

BibTeX

- Keep one refs.bib file with all your references

- Example entry:

```
@article{ewens.72,
    author     = {W.J. Ewens},
    title      = {The sampling theory of selectively neutral alleles},
    journal    = {Theor. Pop. Biology},
    year       = 1972,
    volume =        3,
    pages =         {87--112},
}
```

- Cite with `\cite{ewens.72}`

- Include bib-file right before `\end{document}`:

```
\bibliography{/home/staff/planque/linux/Bib/refs}
```

```
\bibliographystyle{plain}
```
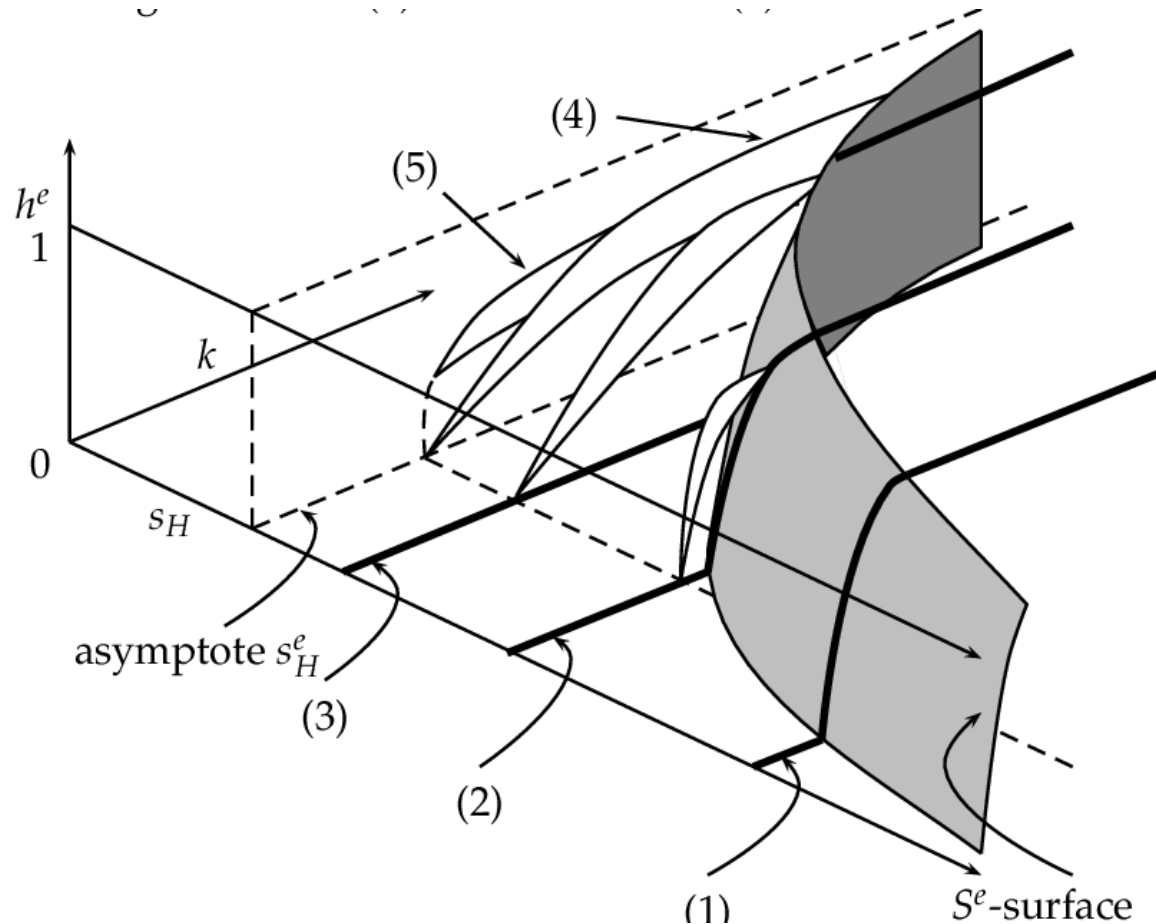
More info

- The not so short introduction to LaTeX2e, by Oetiker, Partl, Hyna and Schlegl

- LaTeX: A document preparation system, by Lamport

- The LaTeX Companion, by Goossens, Mittelbach, Samarin

- CTAN on the web

Goodies

- Program your own pictures with `pstricks`

■ Use AMS styles instead of standard LaTeX styles