Using LaTeX for scientific writing

(part 2)

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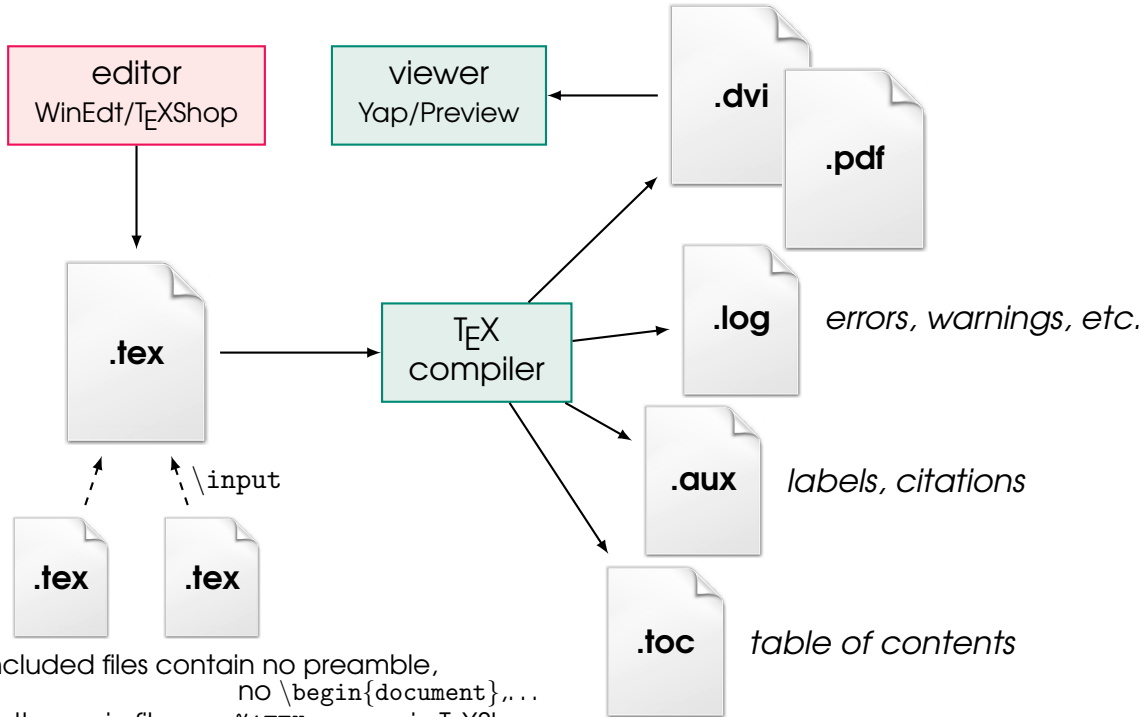
How does LaTeX work?



NB: the included files contain no preamble, no `\begin{document}`,...
to specify the main file, use `%!TEX root =` in TeXShop
`Set Main File` in menu in WinEdt

Table of Contents

The sectioning commands

- `\part{...}` only in the report/book class
- `\chapter{...}` only in the report/book class
- `\section{...}`
- `\subsection{...}`
- `\subsubsection{...}`
- `\paragraph{...}`
- `\subparagraph{...}`

not only typeset their argument in big/bold/etc. letters,
but also write the title and the current page number to the .toc file.

Use then `\tableofcontents` to produce the ToC.

(it simply reads the contents of the .toc file!)

Accents and Special Characters

```
H\^otel, na\"\i ve, \'el\‘eve,\\
sm\o rrebr\o d, !‘Se\~norita!,\\
Sch\"onbrunner Schlo\ss{} Stra\ss e
```

Hôtel, naïve, élève,
smørrebrød, ¡Señorita!,
Schönbrunner Schloß Straße

ó	\'o	ó	\'o	ô	\^o	õ	\~o
ō	\=o	ȯ	\.o	ö	\"o	o̧	\c c
ǒ	\u o	ǒ	\v o	ő	\H o	o̲	\b o
ọ	\d o	o͡o	\t oo	o is any character			

œ	\oe	Œ	\OE	æ	\ae	Æ	\AE
å	\aa	Å	\AA	ø	\o	Ø	\O
ł	\l	Ł	\L	ı	\i	ȷ	\j
¡	!‘	¿	?‘				

Hyphenation

LaTeX hyphenates words whenever necessary

`\hyphenation{`*word list*`}` causes the words listed in the argument to be hyphenated only at the points marked by `-`: e.g.,

```
\hyphenation{FORTRAN Hy-phen-a-tion}
```

allows "hyphenation" to be hyphenated as well as "Hyphenation"
prevents "FORTRAN", "Fortran" and "fortran" from being hyphenated at all

NB: LaTeX does not automatically hyphenate words with special characters (e.g., accented characters or -)

`\-` inserts a discretionary hyphen into a word; this also becomes the only point hyphenation is allowed in this word:

```
semi-au\-to\-matic
```

`\mbox{text}` causes its argument to be kept together under all circumstances:

```
My phone number is \mbox{0116 291 2319}.
The parameter \mbox{\emph{filename}}
should contain the name of the file.
```

My phone number is 0116 291 2319. The parameter *filename* should contain the name of the file.

International Language Support

`\usepackage[`*language1,...*`]{babel}` (last language is by default)

- all automatically generated text strings (Section, etc.) are adapted to the new language
- LaTeX knows the hyphenation rules for the new language

  `\selectlanguage{`*language*`}` changes the active language
- LaTeX has new commands which simplify the input of special characters:
  e.g., with `\usepackage[german]{babel}`, use `"o` for ö instead of `\"o`

Most of the modern computer systems allow one to input letter of national alphabets directly from the keyboard:

`\usepackage[`*encoding*`]{inputenc}`

Western Latin: `applemac` (Mac), `latin1` (Unix), `ansinew` (Windows)
Cyrillic: `macukr` (Mac), `koi8-ru` (Unix), `cp1251` (Windows)
Greek: `iso-8859-7`

Tables

`\begin{tabular}[`*pos*`]{`*spec*`}...\end{tabular}`

pos: vertical position of the table relative to the baseline of the surrounding text (`t`, `b` or `c` to align the table at the top, bottom or centre)

column specification:

`l` for left-aligned, `r` for right-aligned and `c` for centred text;

`p{`*width*`}` for a column containing justified text with line breaks (paragraph)

(If the text in a column is too wide for the page, LaTeX won't automatically wrap it.)

column separator:

`|` for a vertical line or an arbitrary column separator in `@{...}`

horizontal line: `\hline` or `\cline{j-i}`, where j and i are the column numbers the line should extend over

```
\begin{tabular}{|r|l|}\hline
7C0 & hexadecimal \\
3700 & octal \\ \cline{2-2}
11111000000 & binary \\ \hline \hline
1984 & decimal \\ \hline
\end{tabular}
```

7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

Tables (cont.)

```
\begin{tabular}{|p{5.7cm}|}\hline
Welcome to Boxy's paragraph.
We sincerely hope you'll
all enjoy the show.\\ \hline
\end{tabular}
```

Welcome to Boxy's paragraph. We sincerely hope you'll all enjoy the show.

NB: standard units are `mm`, `cm`, `in`, `pt` (1pt = 1/72.27 in = 0.351mm), `ex` (height of x), `em` (width of M)

```
\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}
```

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

```
\begin{tabular}{|c|}\hline
\rule{1pt}{4ex}Pitprop \ldots\\\hline
\rule{0pt}{4ex}Strut\\ \hline
\end{tabular}
```

Pitprop . . .
Strut

NB: see also `\renewcommand{\arraystretch}{1.5}\renewcommand{\tabcolsep}{0.2cm}`

Tables from CSV Files

`scvsimple` package: http://ctan.org/pkg/csvsimple (Comma-Separated Values)

```
\usepackage{csvsimple} % in preamble!
...
\csvautotabular{latex-2-sample.csv}
```

Q	O	OBH	OBP	P
Q1	2	8	29	1
Q2	2	25	11137	19
Q3	1	6	86	9
Q4	13	7	19	14

```
\csvreader[tabular=|c|rcr|,
  table head=\hline query & O & OBH--OBP & P\\\hline,
  late after line=\\\hline]
 {latex-2-sample.csv}{}
 {{\tiny row~\thecsvrow}\
    \bfseries \csvcoli & \csvcolii &
    \csvcoliii--\csvcoliv & \csvcolv}
```

query	O	OBH–OBP	P
row 1 **Q1**	2	8–29	1
row 2 **Q2**	2	25–11137	19
row 3 **Q3**	1	6–86	9
row 4 **Q4**	13	7–19	14

NB: use the `longtable` package for tables that span several pages

http://www.ctan.org/pkg/longtable

Floating Figures and Tables

`\begin{figure}[`*placement specifier*`]...\end{figure}`

`\begin{table}[`*placement specifier*`]...\end{table}`

placement specifier (default `[tbp]`):

- `h` 'here' at the very place in the text where it occurred (useful 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, which could stop this float from being placed.

`\caption{`*caption text*`}` caption for the float
(a running number and the string "Figure" or "Table" will be added by LaTeX)

`\listoffigures` and `\listoftables` are similar to `\tableofcontents` (.lof and .lot)

```
Figure~\ref{white} is an example of Pop-Art.
\begin{figure}[!hbtp]
\fboxsep=0mm\framebox[5mm]{\rule{0pt}{5mm}}
\caption{Five by Five in Millimetres.}
\label{white}
\end{figure}
```

Figure 1 is an example of Pop-Art.

Figure 1. Five by Five in Millimetres.

Formulas in LaTeX

There two ways of typesetting a mathematical formula:

- in-line within a paragraph (text style) `$...$`
- or the paragraph can be broken to typeset it separately (display style) `\[...\]`

```
Add $a$ squared and $b$ squared to get
$c$ squared. Or, using a more mathematical
approach: $a^2 + b^2 = c^2$. Or, using
even more mathematical approach
\[
a^2 + b^2 = c^2
\]
```

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

$$a^2 + b^2 = c^2$$

NB: most of what follows relies on the `amsmath` package (`\usepackage{amsmath}`)

Equation numbers

`\label{`*label*`}` and `\eqref{`*label*`}` work with equation numbers

`\tag{`*name*`}` allows one to change equation number to *name*

`equation*` is the same as `equation` but without numbering

(similar for other equation environments)

```
Einstein says
\begin{equation}
E = mc^2 \label{clever}
\end{equation}
He didn't say
\begin{equation}
1 + 1 = 3 \tag{dumb}
\end{equation}
This is a reference to
\eqref{clever}.
Again, Einstein says
\begin{equation*}
E = mc^2
\end{equation*}
```

Einstein says

$$E = mc^2 \tag{1}$$

He didn't say

$$1 + 1 = 3 \tag{dumb}$$

This is a reference to (1). Again, Einstein says

$$E = mc^2$$

Subscripts and Superscripts

```
$p^3_{ij} \qquad m_\text{Knuth}$
$a^x+y \neq a^{x+y}\qquad
     e^{x^2} \neq {e^x}^2$
```

$p^3_{ij} \qquad m_\text{Knuth}$
$a^x+y \neq a^{x+y}\qquad e^{x^2} \neq {e^x}^2$

```
$f(x) = x^2 \quad f'(x) = 2x
             \quad f''(x) = 2$
$\hat{XY} \quad \widehat{XY} \quad
         \bar{x_0} \quad \bar{x}_0$
```

$f(x) = x^2 \quad f'(x) = 2x \quad f''(x) = 2$
$\hat{XY} \quad \widehat{XY} \quad \bar{x_0} \quad \bar{x}_0$

```
$\vec{a} \qquad \vec{AB} \qquad
\overrightarrow{AB} \qquad
\overleftarrow{BA}$
```

$\vec{a} \qquad \vec{AB} \qquad \overrightarrow{AB} \qquad \overleftarrow{BA}$

```
$\Psi = v_1 \cdot v_2 \cdot \ldots$
$n! = 1 \cdot 2 \cdots (n-1) \cdot n$
```

$\Psi = v_1 \cdot v_2 \cdot \ldots$
$n! = 1 \cdot 2 \cdots (n-1) \cdot n$

Fractions

In **display style**:

```
\[3/8 \qquad \frac{3}{8}
      \qquad \tfrac{3}{8} \]
```

$$3/8 \qquad \frac{3}{8} \qquad \tfrac{3}{8}$$

In **text style**:

```
$1\frac{1}{2}$~hours \qquad
    $1\dfrac{1}{2}$~hours
```

$1\frac{1}{2}$ hours $1\dfrac{1}{2}$ hours

```
\[\sqrt[3]{\frac{x^2}{k+1}}\qquad
x^\frac{2}{k+1}\qquad
\frac{\partial^2f} {\partial x^2} \]
```

$$\sqrt[3]{\frac{x^2}{k+1}} \qquad x^{\frac{2}{k+1}} \qquad \frac{\partial^2 f}{\partial x^2}$$

binomial coefficients

```
Pascal's rule is
\begin{equation*}
\binom{n}{k} =\binom{n-1}{k}
   + \binom{n-1}{k-1}
\end{equation*}
```

Pascal's rule is

$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$$

`\stackrel{#1}{#2}` puts the symbol given in 1 in superscript-like size over 2, which is set in its usual position

```
$f_n(x) \stackrel{*}{\approx} 1$
```

$f_n(x) \stackrel{*}{\approx} 1$

Integrals, Sums and Products

In **display style**:

```
\[\sum_{i=1}^n \qquad \prod_\epsilon
    \qquad  \int_0^{\frac{\pi}{2}}\]
```

$$\sum_{i=1}^{n} \qquad \prod_{\epsilon} \qquad \int_0^{\frac{\pi}{2}}$$

In **text style**:

```
$\sum_{i=1}^n \qquad \prod_\epsilon$
  \qquad  $\int_0^{\frac{\pi}{2}}$
```

$\sum_{i=1}^{n} \qquad \prod_{\epsilon} \qquad \int_0^{\frac{\pi}{2}}$

NB: `\textstyle` and `\displaystyle` change font sizes and the location of sub/superscripts

NB: use `\limits` and `\nolimits` to change the location of sub/superscripts

```
$\sum\limits_{i=1}^n$
```

$$\sum\limits_{i=1}^{n}$$

```
$\underbrace{\overbrace{(a+b+c)}^6
\cdot \overbrace{(d+e+f)}^9}
_\text{meaning of life} = 42$
```

$$\underbrace{\overbrace{(a+b+c)}^{6} \cdot \overbrace{(d+e+f)}^{9}}_{\text{meaning of life}} = 42$$

Functions

```
$\arccos \cos \csc \exp \ker \limsup$
$\arcsin \cosh \deg \gcd \lg \ln$
$\arctan \cot \det \hom \lim \log$
$\arg \coth \dim \inf \liminf \max$
$\sinh \sup \tan \tanh \min \Pr$
$\sec \sin$
```

$\arccos \cos \csc \exp \ker \limsup$
$\arcsin \cosh \deg \gcd \lg \ln$
$\arctan \cot \det \hom \lim \log$
$\arg \coth \dim \inf \liminf \max$
$\sinh \sup \tan \tanh \min \Pr$
$\sec \sin$

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

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

`\DeclareMathOperator` allows one to define new functions (works only in the preamble):

```
\DeclareMathOperator{\argh}{argh}
\DeclareMathOperator*{\nut}{Nut}
\[3\argh = 2\nut_{x=1}\]
```

$$3 \operatorname{argh} = 2 \operatorname*{Nut}_{x=1}$$

Delimiters

LaTeX provides all sorts of symbols delimiters:

```
( [ \{ \lfloor \lceil \langle | \|
```

$$(\; [\; \{ \; \lfloor \; \lceil \; \langle \; | \; \| $$

```
${a,b,c} \neq \{a,b,c\}$
```

$$a, b, c \neq \{a, b, c\}$$

NB: If you put `\left` in front of an opening delimiter and `\right` in front of a closing delimiter, LaTeX will automatically determine the correct size of the delimiter.

Every `\left` must be closed with a corresponding `\right`
(use the invisible `\right.` if needed)

```
\[1 + \left(\frac{1}{1-x^{2}}
        \right)^3 \qquad
\left. \ddagger \frac{~}{~}\right)\]
```

$$1 + \left(\frac{1}{1-x^{2}}\right)^3 \qquad \ddagger \frac{~}{~}\Big)$$

Specifying delimiter size by hand:

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

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

Multiple equations

```
\begin{align*}
f(x) &= (a+b)(a-b)\\
&= a^2-ab+ba-b^2
\end{align*}
```

$$
\begin{aligned}
f(x) &= (a+b)(a-b)\\
&= a^2-ab+ba-b^2
\end{aligned}
$$

```
\begin{align}
f(x) &= 3x^5 + x^4 + 2x^3
        \nonumber \\
&\qquad + 9x^2 + 12x + 23 \\
&= g(x) - h(x)
\end{align}
```

$$
\begin{aligned}
f(x) &= 3x^5 + x^4 + 2x^3\\
&\qquad + 9x^2 + 12x + 23 && (2)\\
&= g(x) - h(x) && (3)
\end{aligned}
$$

other equation environments: `flalign`, `gather`, `multline` and `split`

NB: `align*`, `flalign*`, `gather*` and `multline*`
produce equations without numbers

Arrays and Matrices

```
\begin{equation*}
\mathbf{X} = \left(
\begin{array}{ccc}
   x_1 & x_2 & \ldots \\
   x_3 & x_4 & \ldots \\
\vdots & \vdots & \ddots
\end{array} \right)
\end{equation*}
```

$$\mathbf{X} = \left(\begin{array}{ccc} x_1 & x_2 & \ldots \\ x_3 & x_4 & \ldots \\ \vdots & \vdots & \ddots \end{array} \right)$$

delimiters:

`matrix` (none), `pmatrix` (, `bmatrix` [, `Bmatrix` {, `vmatrix` | and `Vmatrix` ||

the maximum number of columns is 10

```
\begin{equation*}
\begin{matrix}
   1 & 2 \\
   3 & 4
\end{matrix} \qquad
\begin{bmatrix}
   1 & 2 & 3 \\
   4 & 5 & 6 \\
   7 & 8 & 9
\end{bmatrix}
\end{equation*}
```

$$\begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix} \qquad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Spacing in Math Mode

1 mu = 1/18 em

special spacing commands:

- `\,` for 3 mu
- `\:` for 4 mu
- `\;` for 5 mu
- `\␣` for a medium-sized space comparable to the interword spacing
- `\quad` for 1 em (18 mu)
- `\qquad` for 2 em
- `\!` for a negative space of 3 mu

```
\begin{equation*}
\int_1^2 \ln x \mathrm{d}x \qquad
\int_1^2 \ln x \,\mathrm{d}x
\end{equation*}
```

$$\int_1^2 \ln x \mathrm{d}x \qquad \int_1^2 \ln x \,\mathrm{d}x$$

Mathematical Fonts and Symbols

```
$\Re \qquad \mathcal{R} \qquad
\mathfrak{R} \qquad \mathbb{R}$
```

$\Re \qquad \mathcal{R} \qquad \mathfrak{R} \qquad \mathbb{R}$

the last two commands require `amssymb` or `amsfonts` packages

```
$\mu, M \qquad \mathbf{\mu}, \mathbf{M}$
\qquad \boldmath{$\mu, M$}
```

$\mu, M \qquad \mathbf{\mu}, \mathbf{M} \qquad \boldsymbol{\mu}, \boldsymbol{M}$

The package `amsbsy` (included by `amsmath`) makes this much easier:

```
$\mu, M \qquad
\boldsymbol{\mu}, \boldsymbol{M}$
```

$\mu, M \qquad \boldsymbol{\mu}, \boldsymbol{M}$

Font Size

In math mode, the font size is set with the following four commands:

`\displaystyle` (123),

`\textstyle` (123),

`\scriptstyle` (123),

`\scriptscriptstyle` (123)

```
\begin{equation*}
R = \frac{\displaystyle{
\sum_{i=1}^n (x_i-\bar{x})
(y_i- \bar{y})}}
{\displaystyle{\left[
\sum_{i=1}^n(x_i-\bar{x})^2
\sum_{i=1}^n(y_i-\bar{y})^2
\right]^{1/2}}}
\end{equation*}
```

$$R = \frac{\displaystyle\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\displaystyle\left[\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2\right]^{1/2}}$$

Theorems, Lemmas, Definitions, etc.

`\newtheorem{`*name*`}[`*counter*`]{`*text*`}[`*section*`]`

The *name* argument is a short keyword used to identify the "theorem"

With the *text* argument you define the actual name of the "theorem",
which will be printed in the final document

Use the *counter* argument to specify the name of a previously declared "theorem": the new "theorem" will then be numbered in the same sequence

The *section* argument allows you to specify the sectional unit
within which the "theorem" should get its numbers

After executing the `\newtheorem{theorem}{Theorem}` command in the preamble of the document, you can use the following command within the document:

```
\begin{theorem}[Pythagoras]\label{T1}
The square of the hypotenuse of
a right triangle is equal to the sum
of the squares on the other two sides.
\end{theorem}
```

Theorem 1 (Pythagoras). *The square of the hypotenuse of a right triangle is equal to the sum of the squares on the other two sides.*

Theorems, Lemmas, Definitions, etc. (cont.)

The `amsthm` package provides the command which lets you define what the theorem is all about by picking from three predefined styles:

- `definition` (fat title, roman body),
- `plain` (fat title, italic body) or
- `remark` (italic title, roman body).

```
\theoremstyle{definition} \newtheorem{law}{Law}
\theoremstyle{plain} \newtheorem{jury}[law]{Jury}
\theoremstyle{remark} \newtheorem*{marg}{Margaret}
```

```
\begin{law} \label{law:box}
Don't hide in the witness box
\end{law}
\begin{jury}[The Twelve]
It could be you! So beware and
see law~\ref{law:box}.\end{jury}
\begin{marg}No, No, No\end{marg}
```

Law 1. Don't hide in the witness box

Jury 2 (The Twelve)**.** *It could be you! So beware and see law 1.*

Margaret. No, No, No

LaTeX Maths in HTML

http://www.mathjax.org

```
<html>
<head>
<script type="text/javascript"
   src="http://cdn.mathjax.org/mathjax/latest/
                MathJax.js?config=TeX-AMS-MML_HTMLorMML"></script>
<script type="text/javascript">
MathJax.Hub.Config({
  tex2jax: {
    inlineMath: [['$','$'], ['\\(','\\)']],
    processEscapes: true
  }
});
</script>
</head>
<html>
<p>a query is <em>uniquely foldable</em> if it contains no atom
$S(t,t')\in q$ such that there are $R,T \leq_\mathcal{T} S$ with
$R \nleqq_\mathcal{T} T$ and
$\mathcal{T}\models \exists R^- \sqsubseteq \exists T^-$</p>
</html>
```

Chemistry

`mhchem` package: http://ctan.org/pkg/mhchem

`\ce{CO2 + C -> 2 CO}`	$CO_2 + C \longrightarrow 2\,CO$
`\ce{SO4^2- + Ba^2+ -> BaSO4 v}`	$SO_4^{2-} + Ba^{2+} \longrightarrow BaSO_4\downarrow$
`\ce{H+}`	H^+
`\ce{CrO4^2-}`	CrO_4^{2-}
`\ce{H^3HO}`	H^3HO
`\ce{(NH4)2S}`	$(NH_4)_2S$
`\ce{KCr(SO4)2 * 12 H2O}`	$KCr(SO_4)_2 \cdot 12\,H_2O$
bonds: `\ce{C6H5-CHO}`	C_6H_5-CHO
`\ce{A\bond{1}B\bond{2}C\bond{3}D}`	$A-B=C\equiv D$
`\ce{A\bond{~--}B\bond{~=}C\bond{-~-}D}`	$A\tilde{=}B\tilde{=}C\tilde{=}D$
arrows: `\ce{H2O <=> H+ + OH-}`	$H_2O \rightleftharpoons H^+ + OH^-$

NB: for organic chemistry, there is a package based on `tikz` (week 3)

Bibliography: Fast Way

`\bibitem[`*label*`]{`*marker*`}` creates an entry in the `thebibliography` environment

The *marker* is then used to cite the book, article or paper within the document:
`\cite{`*marker*`}`

```
Partl~\cite{pa} has
proposed that \ldots
\begin{thebibliography}{99}
\bibitem{pa} H.~Partl:
\emph{German \TeX},
TUGboat Volume~9, Issue~1 (1988)
\end{thebibliography}
```

Partl (1) has proposed that . . .

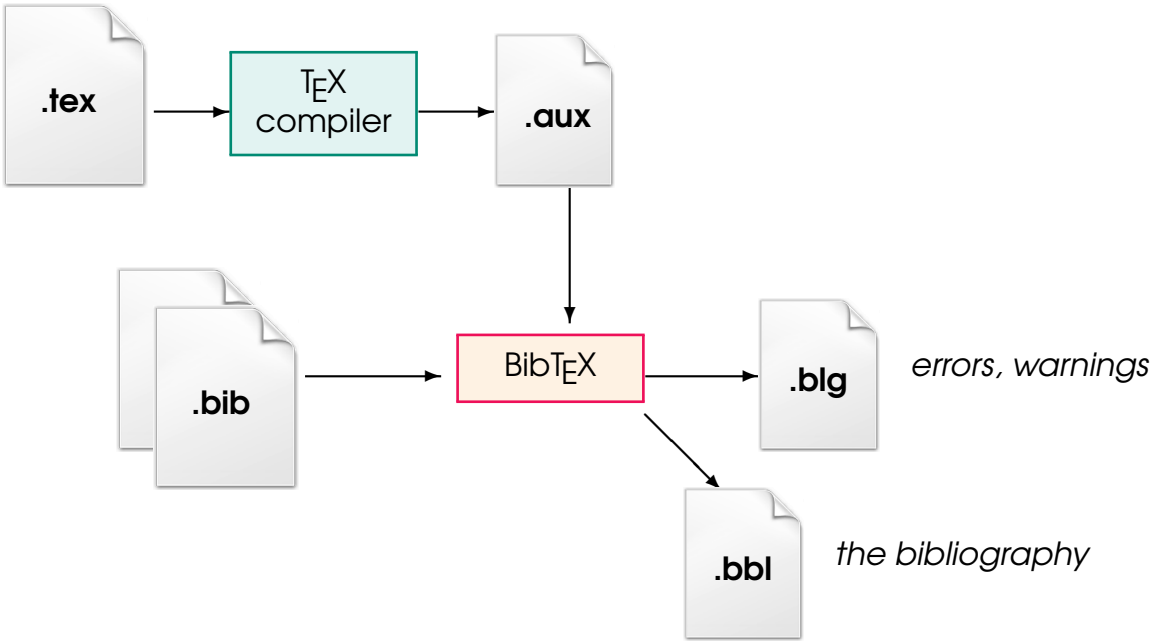
References

(1) H. Partl: *German TEX*, TUGboat Volume 9, Issue 1 (1988)

The entries get enumerated automatically (if the label option is not used)

The parameter after the `\begin{thebibliography}` defines how much space to reserve for the number of labels (99)

Bibliography: BibTeX Way



Bibliography: BibTeX Way

BibTeX is a file format and a program designed to work with LaTeX. The file format stores bibliographical information like author name, journal title, date, etc.

The program incorporates files stored in a BibTeX file (.bib) into LaTeX documents.

A BibTeX database is essentially a plain text file containing bibliography entries:

```
@article{Gettys90,
  author = {Jim Gettys and Phil Karlton and Scott McGregor},
  title = {The {X} Window System, Version 11},
  journal = {Software Practice and Experience},
  volume = {20},
  number = {S2},
  year = {1990}
}
```

`\bibliographystyle{`*plain*`}` sets the style of the bibliography

- `plain` labels have numerical identifiers (e.g. [1]);
- `unsrt` entries are numbered based on when they are cited, not alphabetically by author;
- `alpha` labels are based on the publication year and author(s) name;
- `abbrv` names and journal titles are abbreviated.

`\bibliography{`*bibfile*`}` makes the bibilography, where the BibTeX database is *bibfile*.bib

Running BibTeX

The steps are:

1. Run LaTeX on your .tex file — this will generate the .aux file that BibTeX needs to find the citations.
2. Run BibTeX on your .tex file — this can usually be done from your LaTeX front-tend. If not, use the command line.
3. Run LaTeX on your .tex file — this will create the bibliography section in the document, but will not insert the correct numbering
4. Run LaTeX on your .tex file one more time — this step finishes everything; the references section will be created and all of the citations will be properly numbered.

NB: TeXShop for Mac OS includes an AppleScript that will execute these four steps automatically

NB: MiKTeX includes the **TeXify** command that performs all the required steps

Structure of BibTEX files

`article` An article from a journal or magazine
- required fields: author, title, journal, year
- optional fields: volume, number, pages, month, note

`book` A book with an specified publisher
- required: author or editor, title, publisher, year
- optional: volume or number, series, address, edition, month, note

`booklet` A work that is printed and bound, but without a named publisher or sponsoring institution
- required: title
- optional: author, howpublished, address, month, year, note

`inbook` A part of a book, e.g., a chapter, section
- required: author or editor, title, chapter and/or pages, publisher, year
- optional: volume or number, series, type, address, edition, month, note

`incollection` A part of a book having its own title
- required: author, title, booktitle, publisher, year
- optional: editor, volume / number, series, type, chapter, pages, address, edition, month, note

`inproceedings` An article in a conference proceedings
- required: author, title, booktitle, year
- optional: editor, volume / number, series, pages, address, month, organization, publisher, note

Structure of BibTEX files (cont.)

`manual` Technical documentation
- required field: title
- optional fields: author, organization, address, edition, month, year, note

`mastersthesis` A master's thesis
- required: author, title, school, year
- optional: type, address, month, note

`phdthesis` A PhD thesis
- required: author, title, school, year
- optional: type, address, month, note

`proceedings` Conference proceedings
- required: title, year
- optional: editor, volume / number, series, address, publisher, note month, organization

`techreport` A report published by a school or other institution
- required: author, title, institution, year
- optional: type, number, address, month, note

`unpublished` A document having an author and title, but not formally published
- required: author, title, note
- optional: month, year

`misc` Use this type when nothing else fits
- required: none
- optional: author, title, howpublished, month, year, note

Names in BibTeX

Multiple authors are separated with `and`.

You should type an author's complete name and
let the bibliography style decide what to abbreviate

Most names can be entered in the obvious way:

```
John Paul Jones     Jones, John Paul
Ludwig von Beethoven     von Beethoven, Ludwig
```

Each name consists of four parts: **First**, **von**, **Last** and **Jr**;
each part consists of a (possibly empty) list of name-tokens
tokens in the von part begin with lower-case letters
the Jr part is preceded by a comma

For example, the first name of Miguel Lopez Fernandez is "Miguel" and the last name is "Lopez Fernandez". If you typed `Miguel Lopez Fernandez`, BibTeX would think "Lopez" were a First-part token, so a comma should used: `Lopez Fernandez, Miguel`

Another example: Charles Louis Xavier Joseph de la Vallee Poussin
This name has four tokens in the First part, two in the von, and two in the Last.

NB: If you want BibTeX to consider something a single token, enclose it in braces:

```
{Barnes and Noble, Inc.}
```

Import / Export of BibTeX Files

- JabRef (`http://www.jabref.org`): a reference manager tool for BibTeX
  (import from/export to various formats, including Medline/Pubmed, Endnote)
- Mendeley: see `http://blog.mendeley.com/tag/bibtex/`

a more realistic scenario:

- keep the references in .bib files
- use BibTeX to extract and format cited entries (creates `.bbl` file)
- for the final version, replace the `\bibliography` command by
  the contents of the generated `.bbl` file
- edit the items in the `thebibliography` environment