Intermediate Latex
Handling bibliography

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Outlook

Basic mechanism

- LaTeX defines the environment `thebibliography`, a list where `\item` is replaced by `\bibitem{key}`, where `key` is the (unique) identifier.

Example:
```
\begin{thebibliography}{10}
\bibitem{einstein05}
  A.~\textsc{Einstein};
  "Zur Elektrodynamik bewegter K\"{o}rper";
  Annalen der Physik, \textbf{322}, p. 891--921 (1905);
  URL:~\url{http://dx.doi.org/10.1002/andp.19053221004}.
\bibitem{...}
\end{thebibliography}
```

Giving:

[1] A. Einstein; "Zur Elektrodynamik bewegter Körper"; Annalen der Physik **322**, p. 891–921 (1905); URL: http://dx.doi.org/10.1002/andp.19053221004.

- Citations are inserted in the text by the mean of the `\cite{key}` command like `\cite[equ.~3]{einstein05}`, giving [1, equ. 3].

Work-flow for hand-made bibliography

When the `thebibliography` is present in the `.tex` file, it is handled by
LATEX in the following way :

- Formated bibliography is inserted in the output file, and Citation and bibitem keys are written in the `.aux` file.

- At the next compile time, LATEX resolves the link between citations and bibliography, as the usual way for latex references.
  Hence the minimal work-flow is : `latex latex`

- Writing by hand the `\bibitem` is not really user-friendly, especially if the same references have to be formatted in different ways for different journals or publications.

- For this reason, Oren PATASHNIK and Leslie LAMPORT developed BIBTEX in 1985, with the purpose to separate the reference data (stored in a `.bib` database) from the format defined in `.bst` files.

Principles for automatic bibliography

There are presently two ways to automate the formatting of bibliography:

BibTeX : the traditional and most used.
Format defined by an auxiliary `.bst` file. Uses the `bibtex` or `bibtex`8 or `bibtexu` program.
Pro: simple, fast, widespread.
Contra: not Unicode aware, difficult to customize.

BibLaTeX : the modern flavor, still less used, but increasing rapidly.
Format is defined in pure LaTeX, with `biblatex` package and `.bbx`, `.cbx`, `.dbx`, `.def`, `.cfg` options files. Uses the `biber` program.
Pro: Fully Unicode, easier (?) customization, more elaborate citing styles, much more documents types and much more fields entries.
Contra: Slow, more elaborate/difficult to master, not really stable.

We will first present the traditional BIBTEX route.

Using BIBTEX : the work-flow

1. Define a style by the command `\bibliographystyle{stylefile}`, where `stylefile.bst` is a style file (described below).

2. Define database(s) by `\bibliography{baseone,basetwo...}` where `base*.bib` are bibliographic database files (described below).

3. Run (`pdf`)`latex` : citation defined by `\cite{key}` are written in the `.aux` file, as well as the specified `stylefile` and `bibfiles`.

4. The `.aux` file is processed by `bibtex` or any variant. The resulting `.bbl` file, contains the `thebibliography` environment and is loaded by LaTeX at the next compile time to insert the bibliography in the document.

5. The links to the bibliography are resolved at a further compilation. Hence the minimum work-flow is : `latex bibtex latex latex`.

6. Non-cited documents are ignored, but there is `\nocite{key}` or `\nocite{*}`.

BIBTEX database files I

- By default, BIBTEX recognize the following type of documents:

  article   book   conference   proceedings   inbook[a]
  incollection[a]   inproceedings[a] mastersthesis   phdthesis   manual
  techreport   misc   booklet   unpublished

- Each type has a list of M-andatory or O-ptional fields.
- For `article`:

```
1  @ARTICLE{einstein1905-a,                 % M (key)
2    author = {Albert Einstein},            % M
3    title = {{Zur Elektrodynamik bewegter K\"{o}rper}}, % M
4    journal = {Annalen der Physik},        % M
5    year = {1905},                         % M
6    volume = {322},                        % O
7    pages = {891--921},                    % O
8    number = {10},                         % O
9    doi = {10.1002/andp.19053221004},      % O
10   note = {...}, abstract = {...}         % O
11 }
```

[a] : the `inxxxx` types use a reference to another document in the same bibliography (cross-references).
They are more difficult to handle and often require one more compilation.

BIBTEX database files II

- For `book`:

```
 1 @BOOK{einstein_meaning_2004,              % M
 2   author = {Einstein, Albert},            % M
 3   title = {The {Meaning} of {Relativity} }, % M
 4   year = {2004},                          % M
 5   publisher = {Princeton University Press}, % M
 6   address = {Princeton},                  % O
 7   edition = {5Rev e.},                    % O
 8   isbn = {978-0-691-12027-0},             % O
 9   language = {Anglais},                   % O
10   month = dec,                            % O
11   note = {...}, abstract = {...}          % O
12 }
```

- For other types, see https://en.wikibooks.org/wiki/LaTeX/
  Bibliography_Management#Standard_templates
- For tools to ease the `.bib` creation and management see
  https://en.wikipedia.org/wiki/BibTeX#Uses.

BIBTEX database files III

BibTeX database files can contain other entries that are NOT references, introduced by keywords `@string` and `@preamble`.

- `@string` introduces shortcuts.
  Examples
  ```
  @string{feb="f{\'e}vier"}
  @string{PRL="Phys. Rev. Lett."}
  ```
  so that on can abbreviated with :
  ```
  @article{mykey, journal=PRL, month = feb, ... }
  ```
  - Journal names can be externalized, e.g. jabbrev.bib, used with
    `\bibliography{jabbrev,mybiblio}`.
  - This enable to easily switch from abbreviated journal names to *full* names with another jfull.bib containing `@string` like:
    ```
    @string{PRL="Physical Revue Letters"}
    ```

- `@preamble` bla

BIBTEX style files

- The `.bst` style files must be stored in /`texmf`/`bibtex`/`bst`/
- The citation style reflect some aesthetical or semantic choices from publishers, scientific communities or countries. In Sciences, most journal provide their own style file. There is not a unique choice, but an exuberant multiplicity : there are hundreds of `.bst` files on CTAN!
- The styles can be categorized between "`numeric`" and "`author`" citation styles. Roughly speaking, the latter is preferred in Humanities, and the former in Sciences.
- They can list the references by citation order (unsorted), or sorted by date, or alphabetic by first author.
- The standard BIBTEX comes with the following styles :
    abbrv   acm   alpha   apalike
    ieeetr   plain   siam   unsrt
  but none of them is really satisfactory.
- An example of various styles is shown on the next slides.

Some examples I

Style plain.bst

[1] Albert Einstein. Die Grundlage der allgemeinen Relativitätstheorie. *Annalen der Physik*, 354(7) :769–822, 1916.

[2] Albert Einstein. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field.* Princeton University Press, 5 rev e. edition, 2004.

[3] Albert Einstein, B. Podolsky, and N. Rosen. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? *Physical Review*, 47(10) :777–780, 1935.

[4] Albert Einstein and Nathan Rosen. The particle problem in the general theory of relativity. *Physical Review*, 48(1) :73, 1935.

[5] Albert Einstein and Nathan Rosen. Two-body problem in general relativity theory. *Physical Review*, 49(5) :404, 1936.

[6] Philip M. Morse, Herman Feshbach, and E. L. Hill. Methods of Theoretical Physics. *American journal of physics*, 22(6) :410–413, September 1954.

Some examples II

Style unsrt.bst

[1] Philip M. Morse, Herman Feshbach, and E. L. Hill. Methods of Theoretical Physics. *American journal of physics*, 22(6) :410–413, September 1954.

[2] Albert Einstein and Nathan Rosen. The particle problem in the general theory of relativity. *Physical Review*, 48(1) :73, 1935.

[3] Albert Einstein and Nathan Rosen. Two-body problem in general relativity theory. *Physical Review*, 49(5) :404, 1936.

[4] Albert Einstein. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field.* Princeton University Press, 5 rev e. edition, 2004.

[5] Albert Einstein, B. Podolsky, and N. Rosen. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? *Physical Review*, 47(10) :777–780, 1935.

[6] Albert Einstein. Die Grundlage der allgemeinen Relativitätstheorie. *Annalen der Physik*, 354(7) :769–822, 1916.

Some examples III

Style alpha.bst

[Ein16] Albert Einstein. Die Grundlage der allgemeinen Relativitätstheorie. *Annalen der Physik*, 354(7) :769–822, 1916.

[Ein04] Albert Einstein. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field.* Princeton University Press, 5 rev e. edition, 2004.

[EPR35] Albert Einstein, B. Podolsky, and N. Rosen. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? *Physical Review*, 47(10) :777–780, 1935.

[ER35] Albert Einstein and Nathan Rosen. The particle problem in the general theory of relativity. *Physical Review*, 48(1) :73, 1935.

[ER36] Albert Einstein and Nathan Rosen. Two-body problem in general relativity theory. *Physical Review*, 49(5) :404, 1936.

[MFH54] Philip M. Morse, Herman Feshbach, and E. L. Hill. Methods of Theoretical Physics. *American journal of physics*, 22(6) :410–413, September 1954.

Some examples IIV

Style acm.bst

[1] EINSTEIN, A. Die Grundlage der allgemeinen Relativitätstheorie. *Annalen der Physik 354*, 7 (1916), 769–822.

[2] EINSTEIN, A. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field*, 5 rev e. ed. Princeton University Press, 2004.

[3] EINSTEIN, A., PODOLSKY, B., AND ROSEN, N. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? *Physical Review 47*, 10 (1935), 777–780.

[4] EINSTEIN, A., AND ROSEN, N. The particle problem in the general theory of relativity. *Physical Review 48*, 1 (1935), 73.

[5] EINSTEIN, A., AND ROSEN, N. Two-body problem in general relativity theory. *Physical Review 49*, 5 (1936), 404.

[6] MORSE, P. M., FESHBACH, H., AND HILL, E. L. Methods of Theoretical Physics. *American journal of physics 22*, 6 (Sept. 1954), 410–413.

BibTeX, a better unsorted style: `ieeetr`

The `ieeetr` style is a good[1] example of "unsorted numeric" style:

Style ieeetr.bst

[1] P. M. Morse, H. Feshbach, and E. L. Hill, "Methods of Theoretical Physics," *American journal of physics*, vol. 22, pp. 410–413, Sept. 1954.

[2] A. Einstein and N. Rosen, "The particle problem in the general theory of relativity," *Physical Review*, vol. 48, no. 1, p. 73, 1935.

[3] A. Einstein and N. Rosen, "Two-body problem in general relativity theory," *Physical Review*, vol. 49, no. 5, p. 404, 1936.

[4] A. Einstein, *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field.* Princeton University Press, 5 rev e. ed., 2004.

[5] A. Einstein, B. Podolsky, and N. Rosen, "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ?," *Physical Review*, vol. 47, no. 10, pp. 777–780, 1935.

[6] A. Einstein, "Die Grundlage der allgemeinen Relativitätstheorie," *Annalen der Physik*, vol. 354, no. 7, pp. 769–822, 1916.

BɪʙTₑX, a better author-year style: `apalike`

The `apalike` is a good example of "sorted author-year":

Style apalike.bst

[Einstein, 1916] Einstein, A. (1916). Die Grundlage der allgemeinen Relativitätstheorie. *Annalen der Physik*, 354(7) :769–822.

[Einstein, 2004] Einstein, A. (2004). *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field.* Princeton University Press, 5 rev e. edition.

[Einstein et al., 1935] Einstein, A., Podolsky, B., and Rosen, N. (1935). Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? *Physical Review*, 47(10) :777–780.

[Einstein and Rosen, 1935] Einstein, A. and Rosen, N. (1935). The particle problem in the general theory of relativity. *Physical Review*, 48(1) :73.

[Einstein and Rosen, 1936] Einstein, A. and Rosen, N. (1936). Two-body problem in general relativity theory. *Physical Review*, 49(5) :404.

[Morse et al., 1954] Morse, P. M., Feshbach, H., and Hill, E. L. (1954). Methods of Theoretical Physics. *American journal of physics*, 22(6) :410–413.

BIBTEX, a journal unsorted style: `osajnl`

OSA Journals provide a rather good style file for physics, but journal names are upright and doi is not shown:

Style osajnl.bst with `osajnl2` package

1. P. M. Morse, H. Feshbach, and E. L. Hill, « Methods of Theoretical Physics, » American journal of physics **22**, 410–413 (1954).
2. A. Einstein and N. Rosen, « The particle problem in the general theory of relativity, » Physical Review **48**, 73 (1935).
3. A. Einstein and N. Rosen, « Two-body problem in general relativity theory, » Physical Review **49**, 404 (1936).
4. A. Einstein, *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field* (Princeton University Press, 2004), 5th ed.
5. A. Einstein, B. Podolsky, and N. Rosen, « Can Quantum-Mechanical Description of Physical Reality Be Considered Complete ? » Physical Review **47**, 777–780 (1935).
6. A. Einstein, « Die Grundlage der allgemeinen Relativitätstheorie, » Annalen der Physik **354**, 769–822 (1916).

BIBTEX better author-year with `natbib`

- The `natbib` package is mostly intended to accommodates author-date form, but also numeric style without editing the source. It works with its own style `natbib.bst` but also with modified versions of some standard styles.

- It also features (lot of) variants of `\cite` using the optional argument `label` in `\bibitem[label]{key}`. Most important examples: `\bibitem[Jones et al.(1990)Jones and Williams]{jon90}`:
  – `\citep{jon90}` → (Jones et al., 1990),
  – `\citet{jon90}` → Jones et al., (1990)
  – starred versions print the full author list, if available in `label`.
  – two optional text arguments (pre & post) can be added like `\citep[see][chap.~2]{jon90}` → (see Jones et al., 1990, chap. 2)

- In numeric mode, `\citep{key}` gives the (bracketed) number alone, while `\citet{key}` gives both label and number.

– `natbib` documentation available on: https://ctan.org/pkg/natbib,
– More examples: https://www.sharelatex.com/learn/Natbib_citation_styles.

BɪʙTEX, `natbib` samples: `authoryear`

Natbib with option=`authoryear,round` and style=`plainnat`

Citation of a book :
`\citep[voir][§~12]{einstein_meaning_2004}` → (voir   Einstein, 2004, § 12)
Citation of an article
  `\citep*{einstein_can_1935}` → (Einstein, Podolsky, and Rosen, 1935)
  or `\citet{einstein_can_1935}` → Einstein et al. (1935)

A. Einstein, B. Podolsky, and N. Rosen. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete? *Phys. Rev.*, 47 (10):777–780, May 1935. doi: 10.1103/PhysRev.47.777. URL https://link.aps.org/doi/10.1103/PhysRev.47.777.

Albert Einstein. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field 5e.* Princeton University Press, Princeton, 5rev e. edition, December 2004. ISBN 978-0-691-12027-0.

BIBTEX, `natbib` samples: `numbers`

Natbib with option=numbers,square and style=unsrtnat

Citation of a book :
`\citep[voir][§~12]{einstein_meaning_2004}` → [voir 1, § 12]
Citation of an article
  `\citep*{einstein_can_1935}` → [2]
  or `\citet{einstein_can_1935}` → Einstein et al. [2]

[1] Albert Einstein. *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field 5e.* Princeton University Press, Princeton, 5rev e. edition, December 2004. ISBN 978-0-691-12027-0.

[2] A. Einstein, B. Podolsky, and N. Rosen. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete? *Phys. Rev.*, 47(10):777–780, May 1935. doi: 10.1103/PhysRev.47.777. URL https://link.aps.org/doi/10.1103/PhysRev.47.777.

BIBTEX: custom `.bst` styles I/II

- The `.bst` files are executables code written in a somehow complicated language, mostly because it is a "postfix" language, also known as "Reverse Polish Notation". Hence its modification "by hand", though possible, is very cumbersome.

- By chance there is in TEXdistributions a TeX program called `makebst.tex` (in `texmf`/`tex`/`latex`/`custom`-`bib`) that enables the creation of a custom style (after answering more than 150 questions), et particularly to apply some "national" specificities, including translation but not only.

- In the archive `bib.zip` provided during the course are 6 custom `.bst` files named `these`**-`xxx`, where ** is the language `fr` or `en`, and `xxx` denote the way to display the hyperlinks towards the documents. This is more specifically illustrated on the next slide.

BIBTEX: custom `.bst` styles II/II

- with `thesefr`/`theseen`: URL/doi displayed in full form (standard).
- `these**-doi`: the doi are shown in shorts form :

  [1] A. EINSTEIN, B. PODOLSKY & N. ROSEN; «Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?»; Phys. Rev. **47**, p. 777–780 (1935). doi :10.1103/PhysRev.47.777.

  [2] A. EINSTEIN; *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field*; 5$^\text{e}$ édition (Princeton University Press) (2004); ISBN 978-0-691-12027-0.

  [3] A. EINSTEIN & N. ROSEN; «The particle problem in the general theory of relativity»; Physical Review **48**, p. 73 (1935). doi :10.1103/PhysRev.48.73.

- `these**-href`: The hyperlinks are on reference itself.

  [1] A. EINSTEIN, B. PODOLSKY & N. ROSEN; «Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?»; Phys. Rev. **47**, p. 777–780 (1935).

  [2] A. EINSTEIN; *The Meaning of Relativity – Including the Relativistic Theory of the Non–Symmetric Field*; 5$^\text{e}$ édition (Princeton University Press) (2004); ISBN 978-0-691-12027-0.

  [3] A. EINSTEIN & N. ROSEN; «The particle problem in the general theory of relativity»; Physical Review **48**, p. 73 (1935).

Multiples Bibliographies with BɪʙTₑX I/II

- The bibliography can be split by using the packages `splitbib`, `chapterbib`, or, better, `multibib`.
- Generally speaking, for a PhD in Sciences, it would be a very bad idea.
- For Humanities, one should separate sources according status.
- Using files named `general.bib`, `primary.bib`, `secondary.bib`, do:

```
1    \documentclass[...]{...}
2    \usepackage{multibib}
3    \newcites{prim,sec}{{Sources primaires},{Sources secondaires}}
4    \begin{document}
5    \bibliographystyle{stylegeneral}
6    \bibliographystyleprim{styleprimary}
7    \bibliographystylesec{stylesecondary}
8    \bibliographyprim{primary}
9    \bibliographysec{secondary}
10   \bibliography{general}
11   \begin{document}
12   % body: use \cite{}   or \citeprim{} or \citesec{}
```

Multiples Bibliographies with BIBTEX II/II

The code above works, but for the proper definition of sectioning, table of contents, headers and bookmarks, it must be enhanced as follows.

- If you are in book style or another having chapters, add in preamble :

```
1  \usepackage{etoolbox}
2  \patchcmd{\thebibliography}{\chapter*}{\section*}{}{}
```

- Before the insertion of the bibliography (line 8 on previous slide) add:

```
1      \chapter*{\bibname}
2      \phantomsection
3      \addcontentsline{toc}{chapter}{\bibname}
```

- Before the insertion of each bib section \bibliographyxxxx add:

```
1      \phantomsection
2      \markboth{\bibname}{Sources xxxx}
3      \addcontentsline{toc}{section}{Sources xxxx}
```

Minimal introduction to `BibLaTex`

- `biblatex` is much more powerful, but increases complexity.
- The `.bib` files keep the same spirit as for BibTeX, but the number of document types is above 30, and the number of possibles entries in `@article` is up to 38! The compatibility BibTeX $\rightarrow$ BibLaTeX/biber is quite good, but the reverse doesn't make sense.
- The key idea: almost the whole content of the `.bib` file given back to LaTeX to enable the post-processing by `biblatex`, according its standard, or custom rules. A quick look on CTAN returns more then 50 packages adding some more documents types and processing rules.
- When the `.aux` dile is processed by `biber` one get a `.bcf` file, and the `.bbl` output is a large and not readable XML file.
- We shown on the next slide a snapshot of the "starter" code to use `biblatex`.

biblatex : basic code

- In this basic example two `.bib` files are loaded by the `\addbibresource` command doing the same thing as `\bibliography`, except to write the refs.
- The refs are printed by the final `\printbibliography`.
- The (author-year) style is defined by the provided options.

```
1    \documentclass[...]{...}
2    \usepackage...
3    \usepackage[backend=biber,style=authoryear-comp]{biblatex}
4    \ExecuteBibliographyOptions{sortcites,sorting=nyt,%name/year/t
5        maxnames=3,minnames=3,backref,date=year}
6    \addbibresource{fileone.bib}
7    \addbibresource{filetwo.bib}
8    \begin{document}
9    % content : use \autocite[] or \nocite{} or  variants
10   \printbibliography
11   \end{document}
```

A method for biblatex multiple bibliographies will be provided on demand.

`biblatex`: split bibliography for a single `.bib` file

To label the references by type, one inserts in the preamble the macro:

```
\newcommand{\multibib}[1]{
  \providebool{bibfirst} \forcsvlist{\listxadd\multibiblist}{#1}
  \DeclareListParser*{\forbibitem}{=}
  \expandafter\renewcommand{\do}[1]{ \booltrue{bibfirst}
    \forbibitem{
      \ifbool{bibfirst}{\boolfalse{bibfirst}\xdef\bibkeyword}%
        {\xdef\bibfile}}{##1}
    \addbibresource{\bibfile}
    \map{\perdatasource{\bibfile}
      \step[fieldset=keywords, fieldvalue=\bibkeyword,append]} }
  \DeclareSourcemap{\maps[datatype=bibtex,overwrite=true]{%
    \dolistloop{\multibiblist} }}
}
```

Then the two `\addbibresource{...}` are replaced by the command :

```
\multibib{prim=primary.bib,secd=secondary.bib}
```

Finally the bibliography is produced by :

```
\printbibheading
\printbibliography[keyword=prim, heading=subbibliography,title=Primaires]
\printbibliography[keyword=secd, heading=subbibliography,title=Secondaires]
```

Warning: `keywords` should be missing or finish with a coma like {BibTeX,}.

Encoding problems and solutions for BIBTEX

- The program `bibtex` is only 7-bits encoding (ASCII) aware, and the recommended solution is coding the accents with the old-fashioned style like `M{\'e}canique` → Mécanique, (the { } are mandatory).
- For 8-bits input encoded bib-files (with e.g. `latin`1 aka ISO-8859-1) you should switch to `bibtex`8, and enclose the `\bibliography{<style>}` by the commands `\inputencoding{latin1}` ... `\inputencoding{utf8}`
- The BIBTEX records exported from the web often use UTF-8.
  - A conversion can be done by using the `icode` and `recode` utilities[2]
  - A *imperfect* alyternative solution is using the *undocumented* `bibtexu`. It produces a lot of (harmless) errors, that can be filtered out by using `sed` utility[2], with the command :

`bibtexu myfile | sed "s/6there is a error:  U_ZERO_ERROR//ig"`

- A whole UTF-8 work-flow would be preferable, and is possible by using `biblatex`+`biber`.

---

[2]For Windows see `http://gnuwin32.sourceforge.net/packages.html`.

Outlook

Boxes

——————————————————————————— Typesetting text in TEXconsists in building lines as horizontal boxes and stack them in the page which is a vertical box. No need to enter in this process which is TEX's job. We introduces only the "basic" commonly used boxes of LATEX.

- TEXprimitive boxes: \hbox, \vbox, \vcenter, \vtop.
- LATEXboxes behaves differently with their content, as they can be in horizontal mode (or LR mode) like in hbox), or vertical mode (or paragraph mode) line in \vbox.
- Boxes with horizontal content (Never broken across lines):
  - \mbox{<text>} horizontal box with natural size of <text>.
  - \makebox[<width>][<alignmt>]{<text>} like \mbox but fixed width.
  - \fbox{<text>} and \framebox[<width>][<alignmt>]{<text>} : framed versions of \mbox and \makebox (you should adjust lengths \fboxsep and \fboxrule).
  - \raisebox{<lift>}[<height>][<depth>]{<text>} is like \mbox but raises it by the dimension <lift>.

Boxes (continued)

- Boxes with vertical content:
  - `\parbox[alignmt]{width}{text}` contains text which is broken in lines, and possibly several paragraphs; but no environments.
  - `\begin{minipage}[alignmt]{width}text\end{minipage}`: full emulation of page, `text` can contain (almost) anything of page content (except floats).
- Special "saved" boxes : `\sbox{bin}{text}` and `\savebox{bin}[width][alignment]{text}` are analogous to `\mbox` and `\makebox` respectively, but store the box in the `bin` declared in advance with `\newsavebox`. Its content is printed by `\usebox{bin}`.
- Environment `\begin{lrbox}{bin} text \end{lrbox}` is analogous to `\sbox{bin}{text}` but can be used to define new environments.
- A very large number of "enhanced" boxes is provided by numerous packages...

Page breaking

———————————————————————— Once again, avoid to break the TeXapproach of decomposition of your text, limiting the occurrence of widows and orphans ... If really needed, you nevertheless can tweak the page breaking with commands :

- `penalty<number>` (the number between $-10\,000$ and $10\,000$ is the "badness" that TeX tries to minimize). You can use `penalty`±10000 to ensure/exclude a page break, but prefer `\break`/`\nobreak` (see `https://tex.stackexchange.com/questions/51263`.
- `\pagebreak[0-4]` / `\newpage` force the end of the page. The former extend the vertical spaces to fill the page, while the latter keep the page bottom empty.
- `\clearpage` like `\newpage` plus force to print the trailing floats.
- `\cleardoublepage` like `\clearpage` but open an odd page ..
- `\enlargethispage{length}` extend the `\textheight` by the length added. Limit `length` to 2`\baselineskip`.
- `\smallbreak`, `\medbreak` and `\bigbreak` like `\***skip` but remove

Outlook

Commands I/III

- A great interest of (La)TeX is the possibility to create new commands:
- Two methods to create a command `\mycmd` with two mandatory arguments (max number=9) :
  - TeX: `\def\mycmd#1#2{command-def-using-#1-and-#2}`
  - LaTeX: `\newcommand\mycmd[2]{command-def-using-#1-and-#2}`
- `\def` creates or overwrites `\mycmd`, which is *local* (scopes limited to current group) and *short* (argument limited to one paragraph). This can be changed by using `\long` or `\global`, so that `\long\global\def\mycmd{...}` will define a global long macro.
- `\newcommand` first checks if the command already exist, and fail if it exists. Redefinition can be performed with `\renewcommand` (which fails if the command does not exist).
- `\(re)newcommand` creates *local long* macros. The stared version `\(re)newcommand*\mycmd[2]{...}` creates a *short* macro. No build-in global version.

Commands II/III

- Examples:

  ```
  \newcommand\COII{\ensuremath{\mathsf{CO}_2}}
  \newcommand\fname[2]{\textsc{#2}, #1}
  \newcommand\JD{\fname{John}{Doe}}
  ```
  $\COII \to$ CO$_2$
  $\fname\{John\}\{Doe\} \to$ Doe, John
  $\JD \to$ Doe, John.

- Such formatting commands *(i)* reduce the number of keystrokes, *(ii)* ensure homogeneous formatting *(iii)* make easier to change the choice. E.g. Must chemical element be typeset in roman, such that :

  ```
  \renewcommand\COII{\ensuremath{\mathrm{CO}_2}
  ```
  $\COII \quad \to \quad$ CO$_2$

- One optional argument can be introduced by a second [. . .] after the first one, which contains the default value of #1. Example :

  ```
  \newcommand\fcol[2][blue]{\fbox{\color{#1}\bfseries #2}}
  ```
  such that
  `\fcol{foo}`$\to$ **foo**   but   `\fcol[red]{foo}`$\to$ **foo**.

- Interest of `\def` : *delimited arguments*. Example:

  ```
  \def\braket<#1|#2>{\langle #1\vert #2\rangle}
  ```
  so that `\braket<\chi|\psi>` $\to \langle\chi|\psi\rangle$.

Commands III/III

- As already said, commands with a name containing one or more `@` can not be directly used your LATEX source `.tex`, but only in `.sty` files. The workaround: enclose the commands between `&`.
- Digits are not allowed.
- Command definitions can be *cloned* in other command by using `\let`. Example : `\Re` $\to \Re$ and `\Im` $\to \Im$ but can be enhanced with:

```
\let\origRe=\Re \undef{\Re} \DeclareMathOperator{\Re}{\origRe e}
\let\origIm=\Im \undef{\Im} \DeclareMathOperator{\Im}{\origIm m}
```

which gives `\Re(x)` $\to \Re e(x)$ and `\Im(x)` $\to \Im m(x)$.
- Some macro are `fragile` because when passed to another command or written in the `.aux` file their effect is lost. This can be fixed locally by using `\protect\mycmd`, or on the global scope with `\DeclareRobustCommand{\MyCmd}{...}`

Environments

- Environments can be (re)defined with the command :

  `\(re)newenvironment{envname}[nargs][default]{begdef}{enddef}`

  where `envname` is the name, `nargs` the number of arguments,
  `default` the default value of the first argument, making it optional,
  `begdef` the code executed at `\begin{envname}` and `enddef` the
  code for `\end{envname}`.

- Exemple (elementary) :

  `\newenvironment{myquote}{\begin{quote}\itshape\small }{\end{quote}}`

- Defining an environment on the basis of one or several other is generally
  the easiest way, but will fail with some kind of environments, like
  those that expects their body as a whole (e.g. tabular) or those
  containing verbatim text.

- The package `environ` helps to fix some of these issues, and enable more
  powerful environments.

Command patching I/III

- Layout customization, or command's modification, can be performed by full rewriting of the command. For example, this is done in the package `titlesec`, a common tool to customize sectioning commands.
- This approach usually breaks the structure of the standard commands, and this often introduce packages incomparability (namely `hyperref` or `minitoc`).
- A better approach consist in command *patching*, i.e. modifying only a slight part of the command. We describe here the simplest way, by using the `\patchcmd` defined by package `etoolbox`.

  Syntax: `\patchcmd{\topatch}{search}{replace}{succes}{failure}` where:
    - `\topatch` is the command to alter;
    - `search`: the text or command to be replaced by `replace`[*];
    - `succes`[*] and `failure`[*]: actions performed according to the status;
    - arguments with [*] are mandatory but can be empty.

Command patching II/III

- To know what to `search`, one use the standard command `\meaning` to get the command's definition. For a better formating we define:

```
\newcommand\fmeaning[1]{%
  \noindent{\raggedright\ttfamily\textbf{\string #1}=\meaning#1%
  \par\medskip}}
```

- Then in `article` class we have :

```
\usepackage{etoolbox}
\begin{document}
\fmeaning\section
\end{document}
```

```
\section=\long macro:->\@startsection
{section}{1}{\z@ }{-3.5ex \@plus -1ex \@minus
-.2ex}{2.3ex \@plus .2ex}{\normalfont \Large
\bfseries }
```

- So, to get another formatting you can do :

```
\usepackage{etoolbox}
\begin{document}
\section{Normal section}
\patchcmd{\section}%  \topatch
{\Large \bfseries}%  search
{\flushright\large\sffamily}%  replace
{\typeout{OK}}{\typeout{Fail}}
\section{Modified section}
\end{document}
```

1   Normal section

2   Modified section

Command patching III/III

In a similar way for `\chapter` command in book class:

```latex
\usepackage{etoolbox}
\begin{document}
\makeatletter
\fmeaning\chapter
\fmeaning\@chapter
\fmeaning\@makechapterhead
\makeatother
\end{document}
```

```latex
\usepackage{etoolbox}
\begin{document}
\chapter{A normal chapter}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit,
sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua
\makeatletter
\patchcmd{\@makechapterhead}%
 {\raggedright}{\flushright}{}{}
\patchcmd{\@makechapterhead}%
 {\huge}{\large\sffamily}{}{}
\makeatother
\chapter{A patched chapter}
Ut enim ad minim veniam, quis
nostrud exercitation ullamco
laboris nisi ut\ldots
\end{document}
```

```latex
\chapter=\long macro:->\if@openright \cleardoublepage \else \clearpage
\fi \thispagestyle {plain}\global \@topnum \z@ \@afterindentfalse
\secdef \@chapter \@schapter

\@chapter=macro:[#1]#2->\ifnum \c@secnumdepth >\m@ne \if@mainmatter
\refstepcounter {chapter}\typeout {\@chapapp \space \thechapter
.}\addcontentsline {toc}{chapter}{\protect \numberline {\thechapter
}#1}\else \addcontentsline {toc}{chapter}{#1}\fi \else
\addcontentsline {toc}{chapter}{#1}\fi \chaptermark {#1}\addtocontents
{lof}{\protect \addvspace {10\p@ }}\addtocontents {lot}{\protect
\addvspace {10\p@ }}\if@twocolumn \@topnewpage [\@makechapterhead
{#2}]\else \@makechapterhead {#2}\@afterheading \fi

\@makechapterhead=macro:#1->\vspace *{50\p@ }{\parindent \z@
\raggedright \normalfont \ifnum \c@secnumdepth >\m@ne \if@mainmatter
\huge \bfseries \@chapapp \space \thechapter \par \nobreak \vskip
20\p@ \fi \fi \interlinepenalty \@M \Huge \bfseries #1\par \nobreak
\vskip 40\p@ }
```

Chapter 1
A normal chapter

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor
incididunt ut labore et dolore magna aliqua

Chapter 2
A patched chapter

Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut...