LaTeX Crash Course
GRACE Transferable Skills

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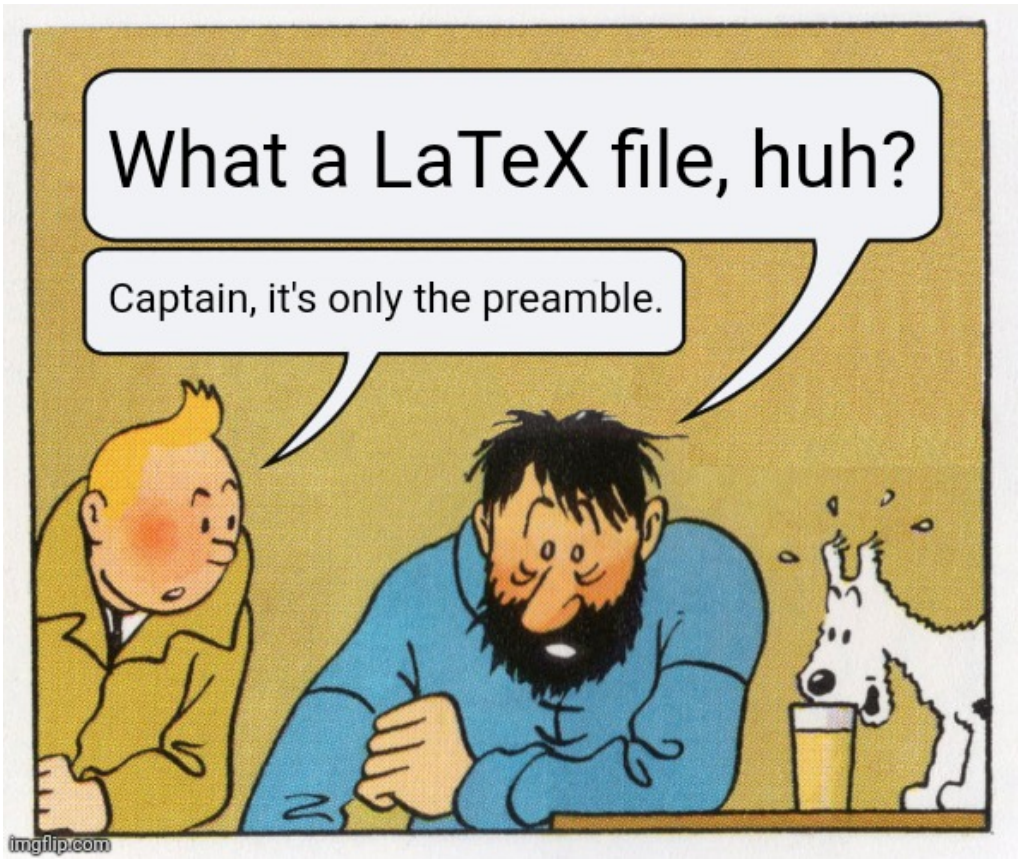
26.05.2025
09:00-13:00

Intro

Welcome back!



Agenda - 21.05.2024

13:00-14:45	Images, tables, formulas with exercises in between
14:45-15:15	Break
15:15-16:00	Bibliographies
16:00-17:00	Specialist packages, self-help competencies, Q&A

Your Questions

Can you animate slides?

Yes.

Can you animate slides?

You can use the animate package to add animations to your slides.

An example from StackOverflow can be found here.

How to include special symbols

Usually, there are special commands for most symbols (some require extra packages - we'll talk about this today, too).

A backslash in text can be done via `\textbackslash`.

How to include special symbols

If you cannot get a link to work because of a backslash, just use two - this "escapes" the command.

For example, `\href{run:\\server\path\dir}{link}` does not work, but `\href{run:\\\\server\\path\\dir}{link}` does (see here).

Different dots

What's the difference between `\dots` and `\ldots`?

In normal text, there is no difference, but the behavior changes when using the `amsmath` package (see here).

General advice is to use `\dots` rather than `\ldots`.

Underfull/overfull boxes

See here and here on Stack Exchange.

There are some packages and commands that help get rid of these problems.

You can also remove automatic hyphenation and hyphenate by hand, or reformulate the sentence.

Different numerals

How to adapt the page numbering, i.e. have Roman numerals for acknowledgments etc.?

It's difficult (and maybe unnecessary) for articles, but for books, you can just use `\frontmatter` and related commands.

See documentation and this answer on Stack Exchange.

Different numerals

Or you can just use `\pagenumbering{}` to switch between Arabic and Roman.

The page numbers will reset, use e.g. `\setcounter{page}{3}` to start from page 3.

Footnote spacing

You can change footnote behavior just like anything else, and there are various ways of doing that.

If you want more space between text and footnotes you can use `\addtolength{\skip\footins}{}` in the preamble (see here).

Images

You begin by uploading your figure/graph/image to Overleaf's file menu on the left.

This works either by clicking the dedicated button or via drag and drop.

For other editors, it's advisable to have everything in the same folder, but it's also possible to use file paths.

Images

```
\begin{figure}
    \centering
    \includegraphics[width=0.7\textwidth]{image_name.png}
    \caption{Your caption}
    \label{fig:image_label}
\end{figure}
```

The classic figure setup

Images

The classic `\begin{figure}` consists of:

- `\includegraphics{}`: the name of the image you want to display
- `\caption{}`: For captioning the image
- `\label{}`: Label for cross-referencing; can also be added to sections, tables etc.
- *caption* and *label* are optional, but helpful

Referencing

As you've seen last week, you can reference chapters, sections etc. by using `\label{}` and `\ref{}`.

`\ref{}` only references the number of the corresponding label. You have to add, section, chapter, figure... yourself.

Use `\nameref{}` if you want to reference something by its title/name.

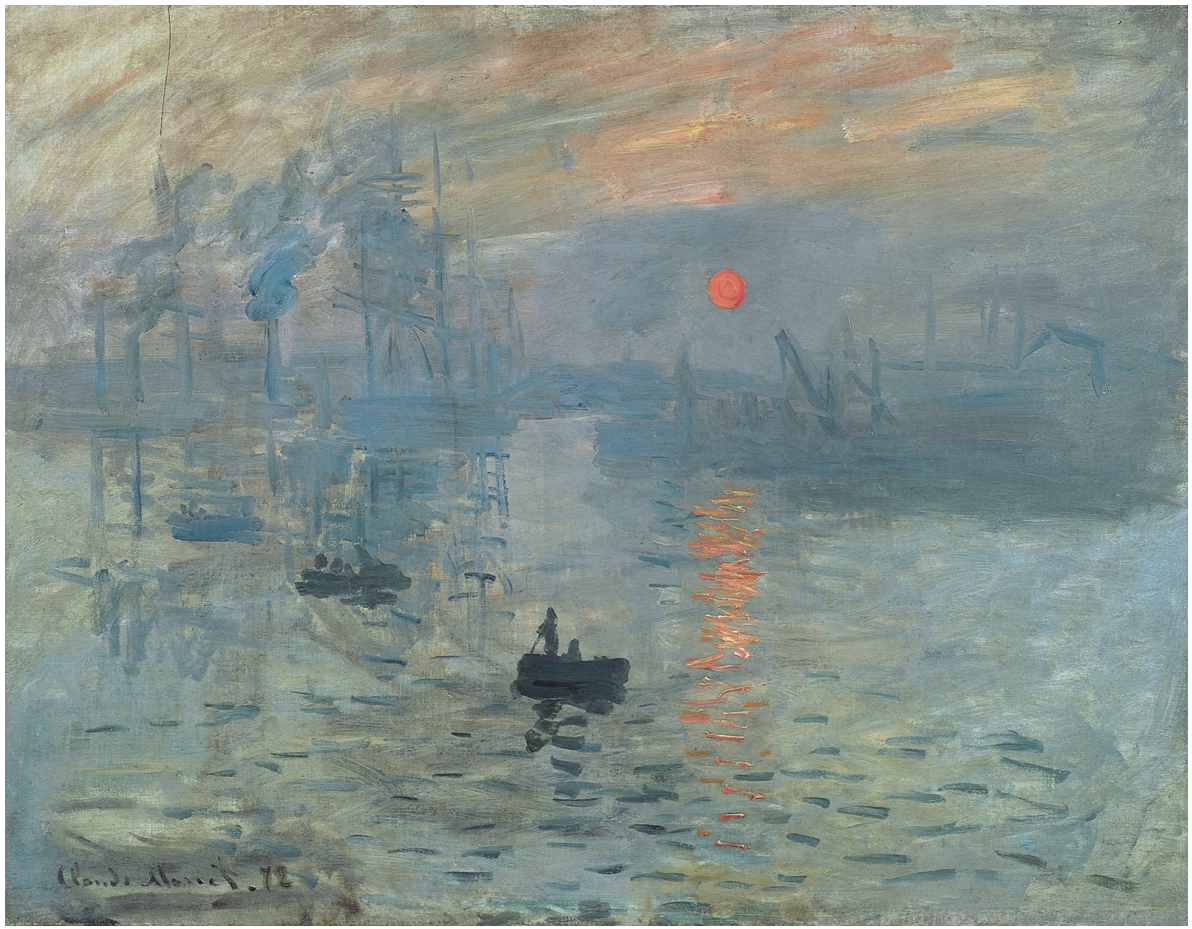
This is useful for section and chapter titles, maybe less so for figures.

Adjusting figure size

Adjusting figure size:

- Often, the original size of a figure won't work for the document
- With the *graphicx* package, you can easily adjust the size
- To adjust the size, use square brackets in the `\includegraphics{}` command

Adjusting figure size



Impression, Soleil levant, by Claude Monet (Source: Wikimedia Commons)

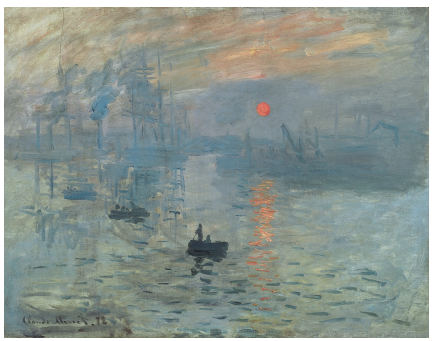
Adjusting figure size

In the preceding slide, I used `\includegraphics[width=0.7\textwidth]{monet.jpg}` to fit it neatly onto the slide.

textwidth here denotes the general area of text, and `[width=0.7\textwidth]` means the image is scaled down to 70% of textwidth.

Another option is to use *scale*, e.g. `[scale=0.5]` to scale a figure down to 50% of its size.

Adjusting figure size



The picture is rather big, so scaling it down to 20% (scale=0.2) of its original size will look like this.
See here for a short tutorial.

Multiple images in one figure

For putting multiple images in one figure, use the *subfigure* environment.

```
\begin{figure}[h]

\begin{subfigure}{0.5\textwidth}
\includegraphics[width=0.9\linewidth, height=6cm]{overleaf-logo}
\caption{Caption1}
\label{fig:subim1}
\end{subfigure}
\begin{subfigure}{0.5\textwidth}
\includegraphics[width=0.9\linewidth, height=6cm]{mesh}
\caption{Caption 2}
\label{fig:subim2}
\end{subfigure}

\caption{Caption for this figure with two images}
\label{fig:image2}
\end{figure}
```

Example taken from the Overleaf tutorial

Placement

There is a range of parameters that will determine a figure's placement. After `\begin{figure}`, put `[h!]` (*h* stands for *here*) if you want to put the table exactly where it appears in the editor (i.e., exactly after one specific paragraph).

The ! overrides internal LaTeX parameters. Simply putting `[h]` would merely put the figure *here, approximately*.

Placement options

- **h** : place figure or figure *here*, approximately
- **t** : place figure or figure at *top* of the page
- **b** : place figure or figure at *bottom* of the page
- **p** : place figure on special *page*
- **!** : override internal LaTeX parameters
- **H** : roughly equal to h!; from the *float* package
- You can put multiple options and only exclude those you definitely do not want

Tables

Creating tables in LaTeX follows a specific formula, but there are many costumisation options.

We can start with one of the simplest examples of a table:

```
\begin{center}
\begin{tabular}{ c c c }
 cell1 & cell2 & cell3 \\
 cell4 & cell5 & cell6 \\
 cell7 & cell8 & cell9
\end{tabular}
\end{center}
```

Open this example in Overleaf.

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

From the Overleaf tutorial

Table components

`\begin{tabular}{ c c c }` is the beginning of the tabular environment and `{ c c c }` indicates that I am building a table with three columns.
The elements within each cell are to be **c**entered (**l** and **r** are also options).

The elements of each row are separated by a &, and you need to put \\ at the end to skip to the next row, if it exists.
You can add as many rows as you like.

Tables

If you want the columns separated by vertical lines, you can specify it by adding | in between the c's:

```
\begin{center}
\begin{tabular}{ |c|c|c| }
 \hline
 cell1 & cell2 & cell3 \\
 cell4 & cell5 & cell6 \\
 cell7 & cell8 & cell9 \\
 \hline
\end{tabular}
\end{center}
```

Open this example in Overleaf.

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

From the Overleaf tutorial

Tables

For horizontal lines, just insert `\hline` in between rows. You can add as many of them as you want.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Tables

The code for the table on the previous slide looks like this:

```
\begin{center}
\begin{tabular}{||c c c c||}
 \hline
 Col1 & Col2 & Col2 & Col3 \\ [0.5ex]
 \hline\hline
 1 & 6 & 87837 & 787 \\
 \hline
 2 & 7 & 78 & 5415 \\
 \hline
 3 & 545 & 778 & 7507 \\
 \hline
 4 & 545 & 18744 & 7560 \\
 \hline
 5 & 88 & 788 & 6344 \\ [1ex]
 \hline
\end{tabular}
\end{center}
```

Open this example in Overleaf.

From the Overleaf tutorial

Table generator

For quickly getting the basic syntax for a table, I recommend the Table Generator (or ChatGPT).

You can change and add to the template at will

Placement

There is a range of parameters that will determine a table's (or figure's) placement. First, you wrap the *tabular* environment into a more generic *table* environment.

After `\begin{table}`, put `[h!]` (*h* stands for *here*) if you want to put the table exactly where it appears in the editor (i.e., exactly after one specific paragraph).

The ! overrides internal LaTeX parameters. Simply putting `[h]` would merely put the table *here, approximately*.

Placement options

- **h** : place table or figure *here*, approximately
- **t** : place table or figure at *top* of the page
- **b** : place table or figure at *bottom* of the page
- **p** : place table on special *page*
- **!** : override internal LaTeX parameters
- **H** : roughly equal to h!; from the *float* package
- You can put multiple options and only exclude those you definitely do not want

Tables

If you have tables that span multiple pages, it is recommended that you use the longtable package.

If you use a statistical software like R, there is likely a package or add-on that will create LaTeX versions of tables, e.g. of regressions.

You can copy them into your document and adjust them as needed.

An example for R is the stargazer package.

Tables

```
\noindent In order to test hypothesis 3, which concerns popularity, I use German press releases only, and add monthly popularity ratings as described in section \ref{perso_iv}. I estimate another
negative binomial model with random intercepts at the party level. The data are again aggregated at a monthly level, and I use \textit{the previous month's popularity rating} to observe how well (or
badly) a party is currently doing. All the other independent variables are added to the analysis as well.\\

\begin{table}[!htbp] \centering
  \caption{The Effect of Popularity on Personalization}
  \label{tab:perso_pop}
\begin{tabular}{@{\extracolsep{5pt}}lcc}
\\[-1.8ex]\hline
\hline \\[-1.8ex]
 & \multicolumn{2}{c}{\textit{Dependent variable:}} \\
\cline{2-3}
\\[-1.8ex] & Mentions Total & PR with Mentions \\
\\[-1.8ex] & (1) & (2)\\
\hline \\[-1.8ex]
 Popularity & $-$0.050 & $-$0.106$^{***}$ \\
  & (0.048) & (0.041) \\
  & & \\
 Ideological Distance& 0.003 & 0.008$^{***}$ \\
  & (0.003) & (0.003) \\
  & & \\
 Lagged DV 1 & 0.005$^{***}$ &  \\
  & (0.002) &  \\
  & & \\
 Lagged DV 2 &  & 0.004$^{*}$ \\
  &  & (0.002) \\
  & & \\
 Total PR & 0.014$^{***}$ & 0.014$^{***}$ \\
  & (0.001) & (0.001) \\
  & & \\
 Junior & 0.199$^{**}$ & 0.022 \\
  & (0.095) & (0.076) \\
  & & \\
 Constant & 2.050$^{***}$ & 2.123$^{***}$ \\
  & (0.326) & (0.265) \\
  & & \\
\hline \\[-1.8ex]
Observations & 344 & 344 \\
Log Likelihood & $-$1,255.545 & $-$1,029.190 \\
Akaike Inf. Crit. & 2,527.090 & 2,074.380 \\
Bayesian Inf. Crit. & 2,557.815 & 2,105.105 \\
\hline
\hline \\[-1.8ex]
\textit{Note:}  & \multicolumn{2}{r}{$^{*}$p$<$0.1; $^{**}$p$<$0.05; $^{***}$p$<$0.01} \\
\end{tabular}
\end{table}
\newpage
```

Table 4.3.: Negative Binomial Regression for Personalization in Dutch and German Press Releases

	Dependent variable:			
	Mentions Total		PR with Mentions	
	(1)	(2)	(3)	(4)
Ideological Distance	0.003	0.003	0.006**	0.006**
	(0.003)	(0.003)	(0.002)	(0.002)
Lagged DV 1	0.003***	0.003***		
	(0.001)	(0.001)		
Lagged DV 2			0.006***	0.006***
			(0.002)	(0.002)
Junior	0.158**	0.161**	0.079	0.080
	(0.076)	(0.077)	(0.050)	(0.050)
Total PR	0.023***	0.023***	0.022***	0.022***
	(0.001)	(0.001)	(0.001)	(0.001)
Netherlands	1.691***		0.726***	
	(0.182)		(0.151)	
Constant	1.124***	1.976***	0.775***	1.148***
	(0.176)	(0.608)	(0.139)	(0.266)
Observations	835	835	835	835
Log Likelihood	−3,609.868	−3,614.626	−2,593.115	−2,596.513
Akaike Inf. Crit.	7,235.736	7,245.252	5,202.230	5,209.025
Bayesian Inf. Crit.	7,273.555	7,283.071	5,240.049	5,246.845
Note:				*p<0.1; **p<0.05; ***p<0.01

Formulas

Inline formulas and equations are written using $ on each side.

E.g. $f(x) = x^2$ looks like this in an editor: `$f(x) = x^2$`

Use two $ at the beginning and end to center equations:

$$f(x) = x^2$$

Formulas

Another option is to use the equation environment from the **amsmath** package.

This also adds numbers to equations by default.

$$f(x) = x^2 \tag{1}$$

Formulas

```
147 \begin{equation}
148     f(x) = x^2
149 \end{equation}
150
```

Creating an equation in a dedicated environment

Like for sections etc. you can omit the numbering by adding an asterisk, like this: `\begin{equation*}`

Other expressions

Fractions: $\frac{1}{x}$ is `$\frac{1}{x}$`

Integral: $\int_b^a \frac{1}{3}x^3$ is `$\int^a_b \frac{1}{3}x^3$`

Sum: $\sum_{i=1}^{n}$ is `$\sum_{i=1}^n$`

You can use as many of these expressions in one equation as you need.

Aligning

The amsmath package also allows you to align equations using the *align* environment:

$$2x - 5y = 8$$
$$3x + 9y = -12$$

```
\begin{align*}
2x - 5y &=  8 \\
3x + 9y &=  -12
\end{align*}
```

amsmath documentation

Some helpful resources for writing equations:

- User's guide
- Wikibooks LaTeX/Mathematics
- Intro with common expressions
- Overleaf tutorial

Formulas

```
173
174 6CO\textsubscript{2} + 6H\textsubscript{2}O $\rightarrow$ C\textsubscript{6}H\textsubscript{12}O\textsubscript{6} + 6O\textsubscript{2}
175
```

becomes

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

There is an easier way to write chemical equations, see frame 61.

Logic symbols

Logic symbols can be used in math mode or as part of the text. You can find a list here.

For example, `$\Rightarrow$` produces $\Rightarrow$

Also, check out LaTeX for Logicians.

Bibliographies

Creating a .bib file

In order to cite works and add a bibliography to the end of your document, you first need to add them to a `.bib` file in the correct format.

You can do this in Overleaf by creating a new file and naming it with the suffix `.bib`, e.g. `example.bib`.

Alternatively, you can also create a .bib file using your text editor of choice, adding references and saving it as with the `.bib` suffix or export them from reference managers like Zotero (more on that later).

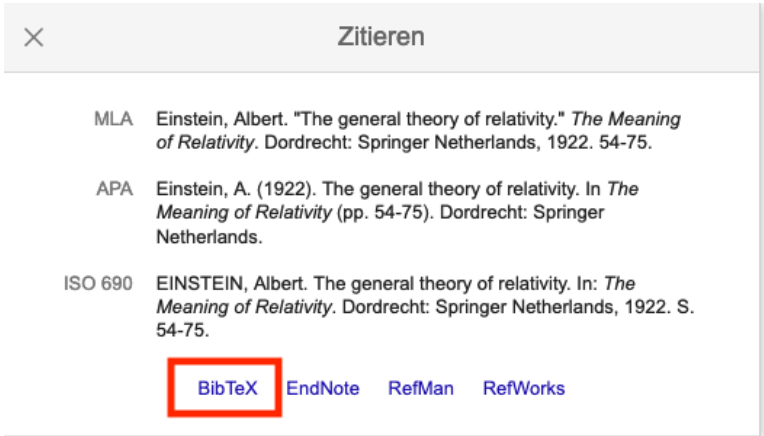
Adding references

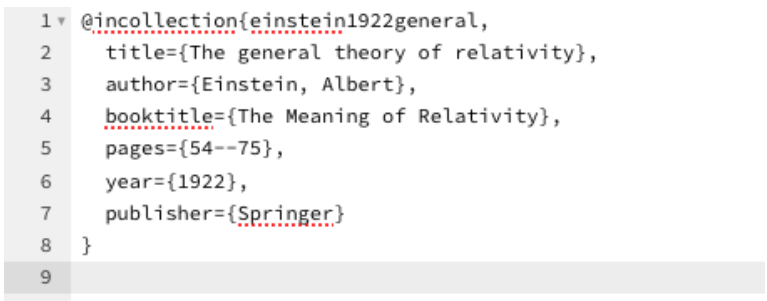
References that are added to a LaTeX file need to be in a specific format.

Luckily, sites like Google Scholar generally have the option of extracting a reference in the proper format; usually labelled as **BibTeX**.

Just copy and paste the reference and add it to your `.bib` file, a.k.a. your bibliography.

Adding references





```
@incollection{einstein1922general,
  title={The general theory of relativity},
  author={Einstein, Albert},
  booktitle={The Meaning of Relativity},
  pages={54--75},
  year={1922},
  publisher={Springer}
}
```

Access and copy-paste a BibTeX reference

You can change the short name (here: *einstein1922general*) to something else if you don't like the default.

Bibliography styles

Using the standard BibTex format, you can cite works by using `\cite{}` in text and choose a bibliography style, see Bibtex bibliography styles.

Standard BibTex covers styles that use numbering or abbreviations in place of full names for in-text citations.

Use `\bibliographystyle{stylename}` to define a style, then `\bibliography{bibfile}` to create the bibliography.

Bibliography styles

In the following example, we use the **natbib** package to make the bibliography, an add-on to standard BibTex.

To add the bibliography, put `\bibliography{example}` at the end of the document (before `\end{document}`)

There are many different citation and bibliography styles, and each field has its own preferences. You can find an overview here.

You can specify the style by adding e.g. `\bibliographystyle{apalike}`, ideally after calling the natbib package.

Citing in text

Using the natbib package, you can cite works in your text by using `\citet{}` and `\citep{}`.

Different disciplines have different citing standards, but generally, `citet{}` is an "ordinary" citation and `\citep{}` puts the whole reference in parentheses.

E.g. APA style: Einstein (1922) and (Einstein, 1922) respectively.

`\citep{}` can be used to cite multiple works.

Citing in text

For standard BibTex citing (i.e. using numbers or abbreviations, not the name-year format), you can just use `cite{}`.

`cite{}` also allows you to cite multiple works at once.

Multiple bibliographies

In Humanities, you might need multiple bibliographies – archival and printed sources, manuscript catalogues, research literature and whatnot.

For this you can either use the package **multibib** and define the different bibliographies using the command `\newcites`, e. g.:

```
\newcites{prime,sec,third,fourth,fifth}{Quelleneditionen,
Forschungsliteratur,Handschriften und ungedruckte
Quellen,Inkunabeln und alte
Drucke,Handschriftenkataloge}
```

Multiple bibliographies

Or you can declare multiple bibliographies in the preambel:

```
\DeclareBibliographyCategory{sec}
\defbibheading{sec}{\section*{Forschungsliteratur}
\newcommand*{\citesec}[3]{\addtocategory{sec}{3}
\cite[1][2]3
```

Multiple bibliographies

Using the first option looks like this:

```
Here I am citing a source edition.\citeprime[S.
230--498]{hegel_chroniken_1870}
```

In the document :

[2]Hegel (1870), S. 230–498

At the end of the document in the bibliography:

Gedruckte Quellen

Badische Historische Commission (Hrsg.): Regesten der Markgrafen von Baden und Hachberg 1050–1515. Bd. 1: Markgrafen von Hachberg 1218–1428. Innsbruck 1900.

Bartsch, Karl (Hrsg.): Konrads von Würzburg Partonopier und Meliur. Aus dem Nachlasse von Franz Pfeiffer. Wien 1871. (Nachdruck mit einem Nachwort von Rainer Gruenter. Berlin 1970).

Hegel, Carl (Hrsg.): Die Chroniken der oberrheinischen Städte. Straßburg 1 (Die Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 8). Leipzig 1870.

Multiple bibliographies

Using the second option looks like this:

```
Here I am citing research literature.\footnote{Zu
mittelalterlichen Reiseberichten als Gattung
\citesec{vgl.}{}{achnitz_reiseberichte_2012}.  ...}
```

In the document :

285 Zu mittelalterlichen Reiseberichten als Gattung vgl. Achnitz: Reiseberichte und Geschichtsdichtung. Zu anonymen Pilgerreiseberichten vgl. Huschenbett: Art. Pilgerreiseberichte über Palästina.

At the end of the document in the bibliography:

Forschungsliteratur

Achnitz, Wolfgang (Hrsg.): Reiseberichte und Geschichtsdichtung. Mit einführenden Essays von Gerhard Wolf und Christoph Fasbender, Berlin 2012 (Deutsches Literatur-Lexikon. Das Mittelalter Bd. 3).

Resources

- Bibliography management in LaTeX
- BibTeX bibliography styles
- Bibliography management with natbib
- natbib citation styles
- Jurabib for law and humanities
- For citations in a document in the form specified by a BibTeX style

Integration with other bibliography software

You can directly link your Overleaf account to Zotero or Mendeley - but that is a premium feature, unfortunately.

Luckily, there are other ways of combining utilizing LaTeX in addition to other reference management software.

The following example uses Zotero, but most reference managers should work along those same lines.

Zotero

The easiest way to re-use your Zotero database is to **export** libraries to BibTeX format (i.e. a `.bib` file)

To do that, just go to *File* → *Export Library* to create a `.bib` file that you can then upload to Overleaf or add to your LaTeX editor of choice.

If you only want to export some but not all references, you can select them, then right click and choose *Export...*

Chapter bibliographies

I do not have personal experience with this, but there is a package called *chapterbib* that allows you to put a select bibliography based on the same `.bib` file after each chapter.[1]

You can find a reproducible example here and an Overleaf template here.

[1] It's also possible to create different bibliographies for each chapter.

Common Issues

- No capitalization: put curly brackets around either the capitalized letter or the whole word to make sure it appears properly in the bibliography
- ? instead of reference in text: sometimes it takes a while to sync, so best option is to recompile; could also be a typo or missing info in reference
- Style suddenly changes: probably something off with the last reference you added to your `.bib` file (can happen if you use natbib, as most references ar optimized for BibTex).

Specialist packages

mhchem

mhchem offers a range of tools to write chemical expressions and reactions.

$CO_2 + C \longrightarrow 2\,CO$ and Sb_2O_3 can be written as

`\ce{CO2 + C -> 2 CO}` and `\ce{Sb2O3}`

ChemFig

ChemFig is a package for drawing molecules.

I haven't tested it myself, but it appears to be widely used.

Tables across pages

For tables that span multiple pages, the longtable package is the way to go. You can also find an example here.

Non-Latin alphabets

Some languages do not require much extra work, and packages like *fontenc* and *inputenc* are enough, for example Greek.

Here are examples of ancient Greek and modern Greek.

Non-Latin alphabets

Some languages may require you to change the *compiler*. The standard is pdfLateX, but in Overleaf, you can easily change to XeLaTeX or LuaLaTeX.

If you're working with multiple languages, it is recommended to additionally use the **polyglossia** package.

Generally, you can create dedicated sections/environments for most languages that also take *direction* into account (left to right or vice versa)

Non-Latin alphabets

package allrunes

- Germanic Runes: ᚠᚢᚦᛃᛉᚾᛞ
- Anglo-Frisian Runes: ᚠᚢᚦᛇᛋᛞ
- Normal Runes: ᚠᚢᚦᚨᚳᛋᛏᛏ
- Medieval Runes: ᚠᚢᚦᛁᚱᛋᛏ

Non-Latin alphabets

Middle High/Low German(ic) characters

- Superscripts, with \usepackage[safe]{tipa}
  - zů mînem brůder
  - rõmsche künge
- Special characters:
  - æ Æ ð Đ with \usepackage[icelandic]{babel} and \usepackage[T1]{fontenc} (this messes with bold text, however)
  - Use the symbols list, the **xunicode** package (with another compiler, XeLaTeX).

Special fonts

A lot of special fonts are available online – you can even produce documents using Comic Sans (with a bit of passion and installation), or Gothic Script.

Non-Latin alphabets

Helpful resources:

- General overview for multilingual typesetting & polyglossia
- Unicode reference list
- Change the compiler
- Chinese: compiler change recommended
- Japanese: *CJKutf8* package, no compiler change needed
- Korean: compiler change required

Uni Basel templates

I couldn't find anything for dissertations, but there are various templates for other theses that could be adapted:

- GitHub repo with templates for Bachelor's and Master's theses
- Template for seminar papers
- Template for Master's thesis

Evaluation

Scan the code or go here:
https://evasys.unibas.ch/evasys/online.php?p=UK9DE

Google is your friend – seriously!

It's in no way bad to look for help online. Stack Overflow/Stack Exchange and other forums are particularly useful for LaTeX questions.

- (Re-)Use templates – your own or other people's (and materials from this course ☺)
- Overleaf has many templates and useful tutorials
- Uni Basel LaTeX template.
- Wikibooks on LaTeX
- Practice, practice, practice

Questions?

We're here to help - not just with LaTeX

Our website and mail address

Thank you for your attention!