Scientific writing and bibliographic research

Week 3

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Tips for writing

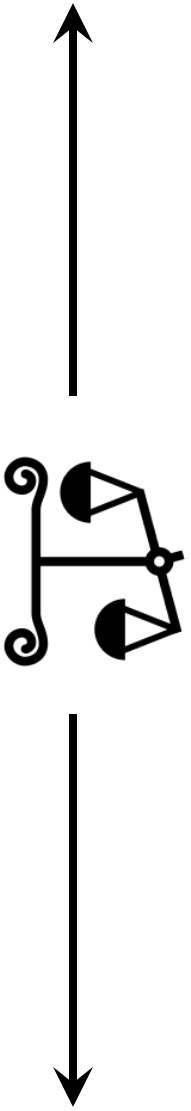
Note taking

- Write short summaries of sources
  - Claims
  - Reasons
  - Evidence
  - Applications and limitations
  - Your impressions
- Keep a lab diary (Example)
  - Experiments
  - Code versions
- Describe your evidence
  - Data sets
  - Observations
  - Experimental results

Draft early!

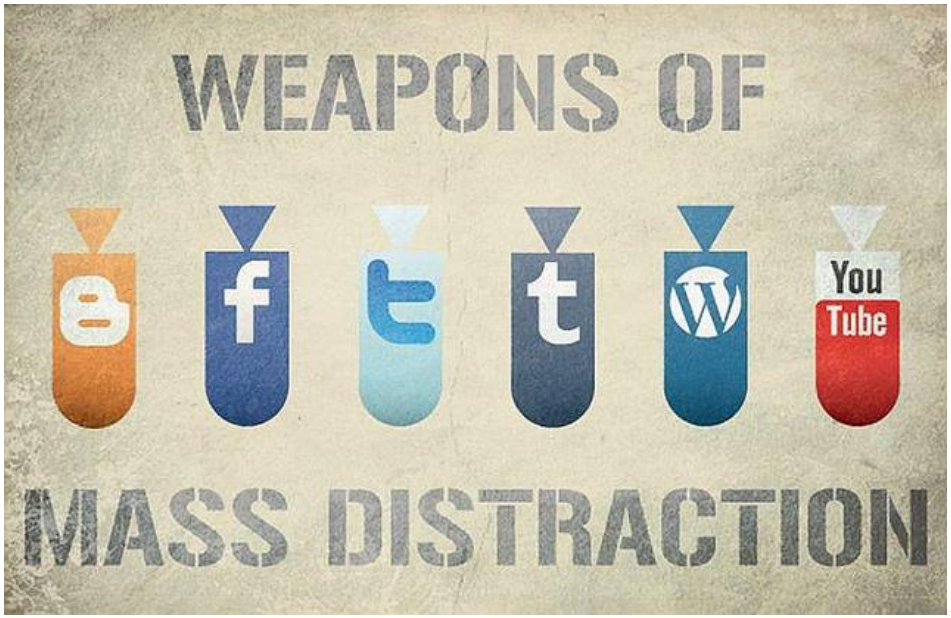
The first draft

- Strategy A: Quick and dirty (generally recommended)
  - Sketch the argument
  - Fill in the gaps without regard for style or grammar
  - Re-use notes taken earlier
  - When on a run, do not care about spelling or citation styles
  - If stuck, take note where and switch to the next section
  - When blocked, switch to clean-up work (spelling, citations, …)
- Strategy B: Slow and clean (works also)
  - Finish section by section
  - Take care of all details
  - Problems:
    - Hard to revise later
    - Slow progress towards a complete report

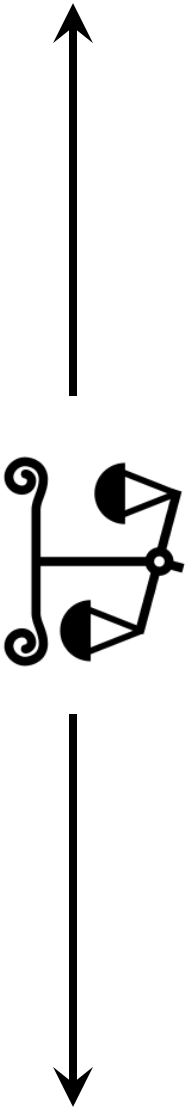


Writing with distractions vs. in the zone

- Distractions: social media, mobile apps, friends, …



Source: https://www.flickr.com/photos/birgerking/6875893248
by Hunter Lang used under CC-BY (without changes)



- flow (psychology), the zone
  - complete absorption in what one does, very focused, concentrated
  - Athlete of extreme (adrenaline) sport
  - 無爲 (wu wei in Taoism)
  - hack mode

The first draft: A plan

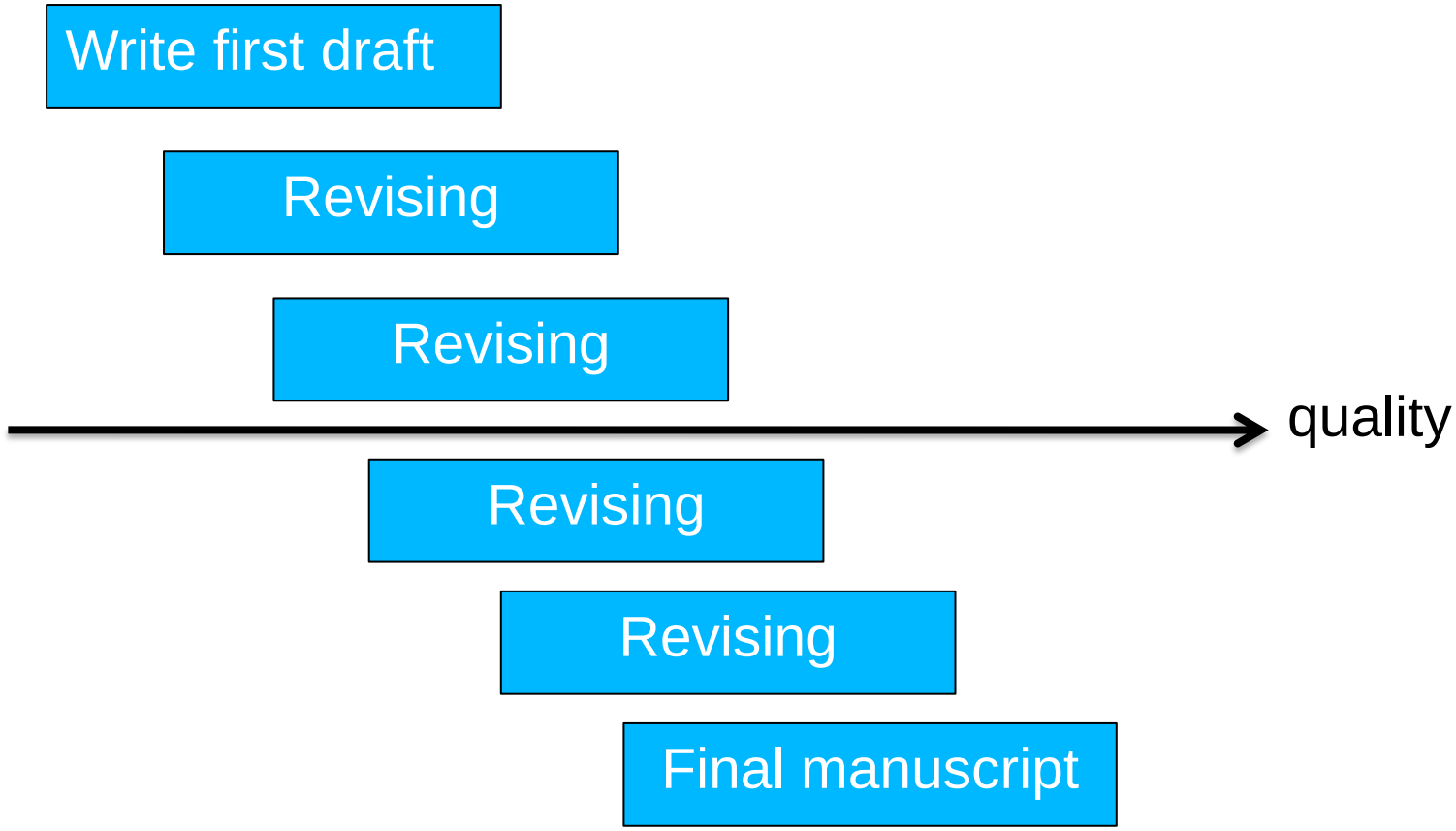
- Sketch the introduction
  - Goal: motivate reading
  - Brief context
  - Problem summary
  - Your main point

- Condition of incomplete knowledge
- Consequences of not understanding

- Response to problem
- State the idea of a solution **OR**
State where the report is heading

- Organize the body
  - Background, definitions and preliminaries
  - Order reasons and evidence
    - Create sections accordingly
  - Locate acknowledgements and responses
- Find a conclusion
  - Summary of the main argument
  - Further research

Revising



- "**I rewrote** the ending of Farewell to Arms, the last page of it, **39 times** before I was satisfied." (Hemingway 1956)

Revising

- Consider the report as a whole
- Take the viewpoint of your reader:
  - Can I follow the argument?
  - Are all definitions given?
  - Is the purpose of each section clear?
  - Are the sections properly connected?
- Rethink the structure of your thesis
  - Everyone should be able to follow the argument
  - Do I need to refer forward or backward often? → think about restructuring
- Avoid basic writing errors
  - Fix spelling mistakes
  - Punctuation are also important
  - Be aware of false friends (e.g. gift ≠ Gift)

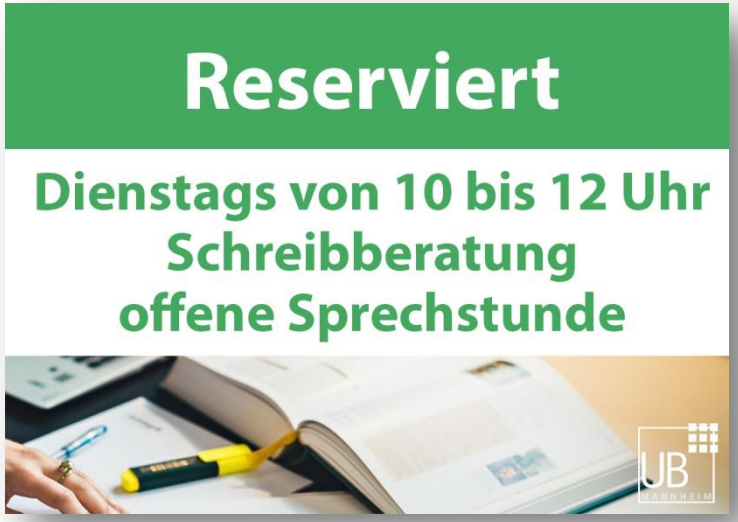
Final words

- Think about presenting your data properly
  - Tables or graphs?
  - In-text or as appendix?
- “Optimize” graphs and tables
  - Do this at the end, but schedule some time for the task
  - One can spend a long time on a simple table

Picture: Pixabay

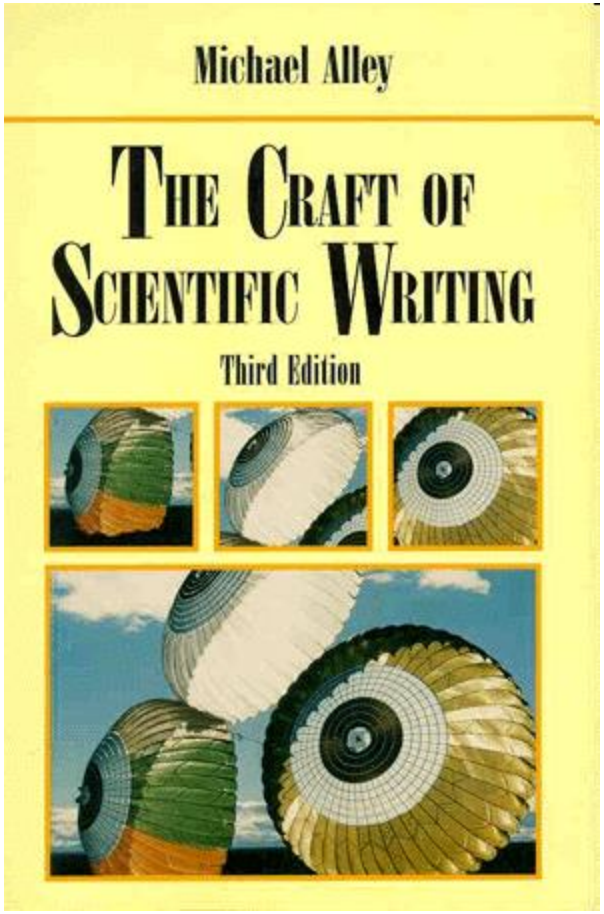
Need help: Our Services at the Library

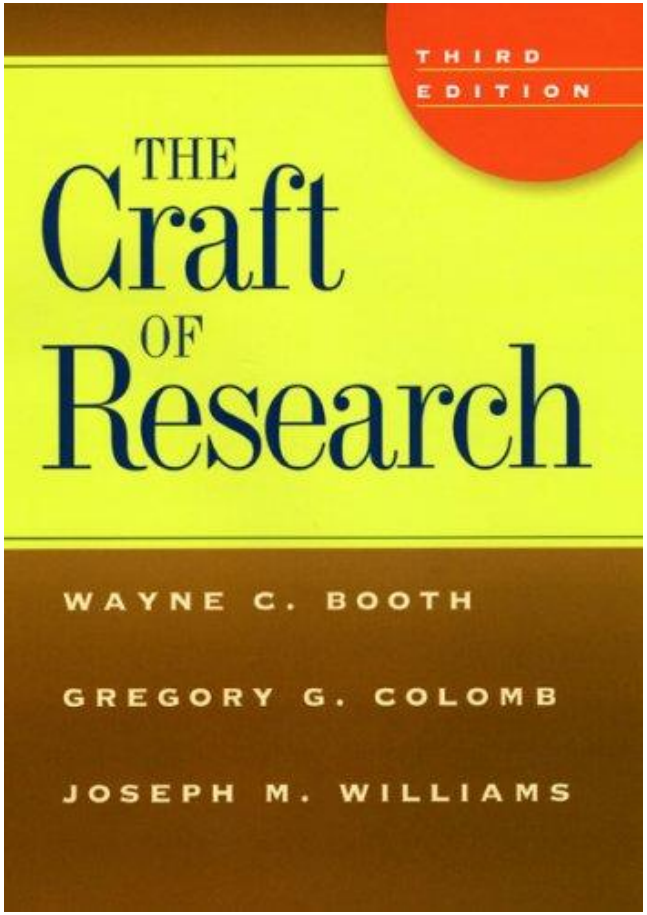
- Subject librarians
  - Recommendation for Acquisition
  - Finding literature or data
  - Subject specific questions
  - Support by Email and Face-to-Face
- Writing consultancy
  - English and German
  - in the LearningCenter
  - for students of all disciplines
- Reference management team
  - Courses for Zotero, Citavi, Mendeley
  - Support by Email and Face-to-Face
- More courses (Portal2)
- Help with using library services: Chat, InfoCenter



Further reading

- Booth, Colomb, Williams: The Craft of Research, Part IV
- Alley: The Craft of Scientific Writing





LaTeX

Introduction: Typesetting

- How to align text in a block nicely?
  - line break
  - separation into syllables / hyphenation (=Silbentrennung)
- What is the optimal line length for readability?
- Can I mix two fonts in the same document?
- Does the space between two lines depend on the font size?
- How to include mathematical formulas?
- What are „Hurenkinder“ and „Schusterjungen“ and how to avoid them (“widows” and “orphans” in English)?

Preliminaries

- TeX is a typesetting program
- LaTeX
  - is not a WYSIWYG word processor
  - is a markup language and document preparation system
  - is a requirement for thesis papers by several groups
  - is a requirement for most journals and conferences
- BibTeX
  - Adds management of bibliographic resources to LaTeX
  - Is also a metadata format
  - Allows easy referencing across hundreds of sources
- PDFLaTeX
  - Directly creates PDF files
  - (LaTeX came with its own graphic format, DVI)
  - Is a binary parsing and compiling .tex files

Understanding LaTeX syntax

- \ % & $ # _ ^ { } and ~ are special characters
  - Used in your LaTeX document, they have a special meaning
  - If you simply want the character to be printed, then use backslash in front of the special character, e.g. \%. And \backslash for the backslash.
- \ is used to start command names
- % is used to start a comment
- Words are separated by one or more spaces
- Paragraphs are separated by one or more blank lines
  - The output is not affected by adding extra spaces or extra blank lines to the input file.
- Descriptions instead of format instructions
  - \emph for emphasize
  - rather than “Bold 12pt”

Document class

- At the beginning of every LaTeX document:

  \documentclass[options]{class}

- Classes
  - article
  - book
  - report
  - letter
  - …
- Options
  - 11pt, a4paper, twocolumn, draft, …
- LaTeX uses style sheets or document classes
  - Class definitions determine the look and feel of a document
  - Class definitions can be overridden...but usually you don’t need to

Basic document

```
\documentclass{article}
```

“use document style for articles”

```
\begin{document}
```

“here the document begins”

```
Hello World
```

Text which will be shown

```
\end{document}
```

“here the document ends”

Document with title page

```
\documentclass{article}

\begin{document}

\title{My Title}
\author{My Name}
\maketitle

Here is my content.

\end{document}
```

Document structure

- \chapter{Chapter Heading}
- \section{Section Heading}
- \subsection{Subsection Heading}
- …

- depends on the documentclass

- numbered automatically

- automatic generation/update of the table of contents: \tableofcontents

Document with structure

```
\documentclass{article}

\begin{document}

\section{Introduction}
Here is my content.

\subsection{Motivation}

\section{Conclusion}
In this work, we had a look at…

\end{document}
```

Document with table of contents

```
\documentclass{article}

\begin{document}

\tableofcontents

\section{Introduction}
Here is my content.

\subsection{Motivation}

\section{Conclusion}
In this work, we had a look at…

\end{document}
```

Document with formula

```
\documentclass{article}

\begin{document}

Let $\alpha_1, \alpha_2, \alpha_3 > 0$
be the angles of a triangle, then

\begin{equation}
   \sum_{i=1}^3 \alpha_i =\pi
   \label{eq:triangle-sum}
\end{equation}

The Equation \ref{eq:triangle-sum} was
proven a long time ago.

\end{document}
```

inline mathematical mode (between normal text)

Equation environment for a single line with a mathematical formula

Equations

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

Einstein says

$$E = mc^2 \qquad (1)$$

He didn't say

$$1 + 1 = 3 \qquad (2)$$

This is a reference to 1.

Floats

- material that belong together vs. page breaks
- avoid partially filled pages → free flowing elements (floats)
- Free-flowing portion of the layout
  - Pictures
  - Charts
  - Tables
  - Text boxes
- Commands
  - **\begin{figure} … \end{figure}**
  - **\begin{table} … \end{table}**
  - **\caption{<TEXT>}** inside the float environment
  - **\label{<TEXT>}** *must* be after a caption, and inside the float

Document with picture

```
\documentclass{article}

\usepackage{graphicx}

\begin{document}


\begin{figure}[ht]
\centering
   \includegraphics[width=0.8\textwidth]{pic.jpg}
   \caption{My picture}
   \label{fig:pic}
\end{figure}

\end{document}
```

preferred position of the float (h=here, t=top, b=bottom, …)

scope of centering is inside its group, i.e. here inside the figure environment

Document with list of pictures

```
\documentclass{article}

\usepackage{graphicx}

\begin{document}

\listoffigures

\begin{figure}[ht]
\centering
   \includegraphics[width=0.8\textwidth]{pic.jpg}
   \caption{My picture}
   \label{fig:pic}
\end{figure}

\end{document}
```

Tables

- Tabulars
  - Starts with **\begin{tabular}** and ends with **\end{tabular}**
  - Rows are seperated by \\ and & splits into the columns

Specify the number of columns and their alignment (r=right, l=left, c=center)

```
\begin{tabular}{|r|l|}
   \hline
   1 & one\\
   2 & two\\
   3 & three\\
   \hline
\end{tabular}
```

1	one
2	two
3	three

- Should be inside a **table** float

Document with a table

```
\documentclass{article}
\begin{document}

\begin{table}[ht]
   \centering

   \begin{tabular}{|r|l|}
      \hline
      1 & one\\
      2 & two\\
      3 & three\\
      \hline
   \end{tabular}

   \caption{Count from 1 to 3}
   \label{tab-numb}
\end{table}

\end{document}
```

Citations and bibliography

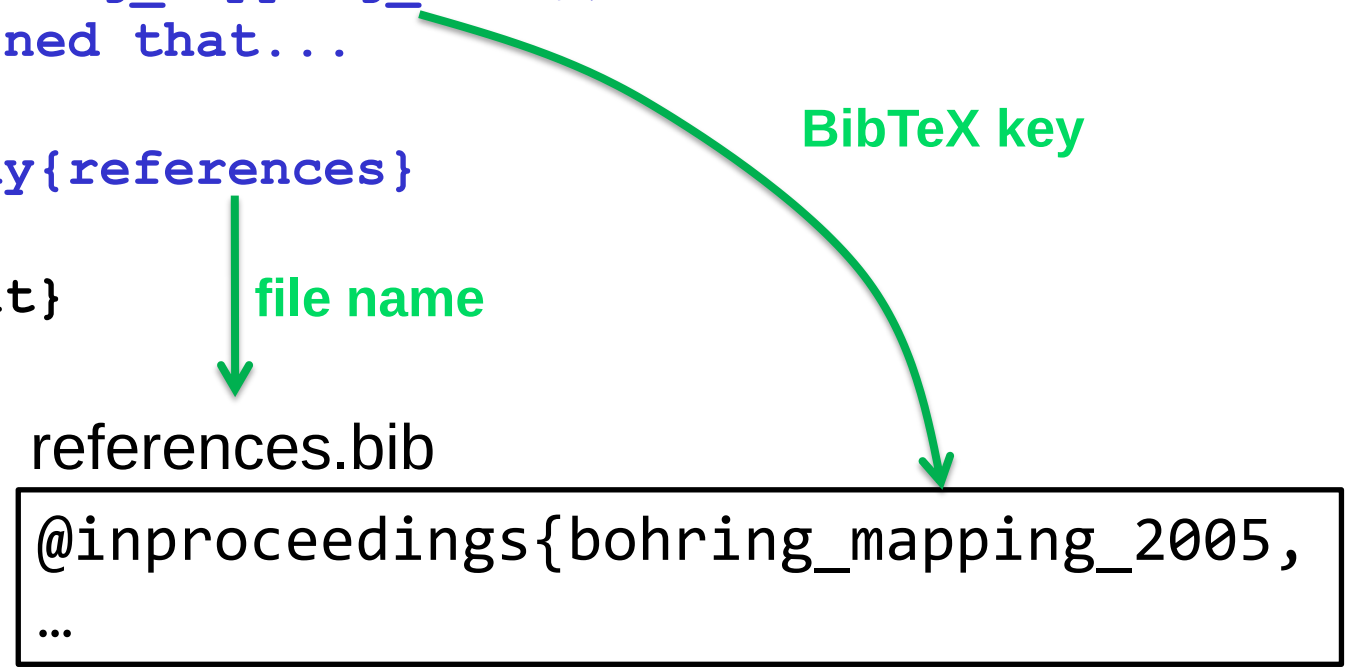
- BibTeX-Export from Zotero will generate bib-file (put it in the same directory as the tex-file)

!! BibTeX ≠ BibLaTeX !!

- Connect them by adding \bibliography{*filename_of_the_bib_file*} in the tex-file
- Create citations with \cite{*BibTeX_key*}, also possible:
  - \cite[p.~215]{citation01} OR \cite{citation01,citation02,citation03}
- Zotero generate BibTeX key as a combination of the lastname of the firstauthor, first word of the title and the four-digit year (check the bib-file if in doubt)
- Use \bibliographystyle{} with *plain, alpha, apalike, IEEEtran, …* to show the bibliography in this style

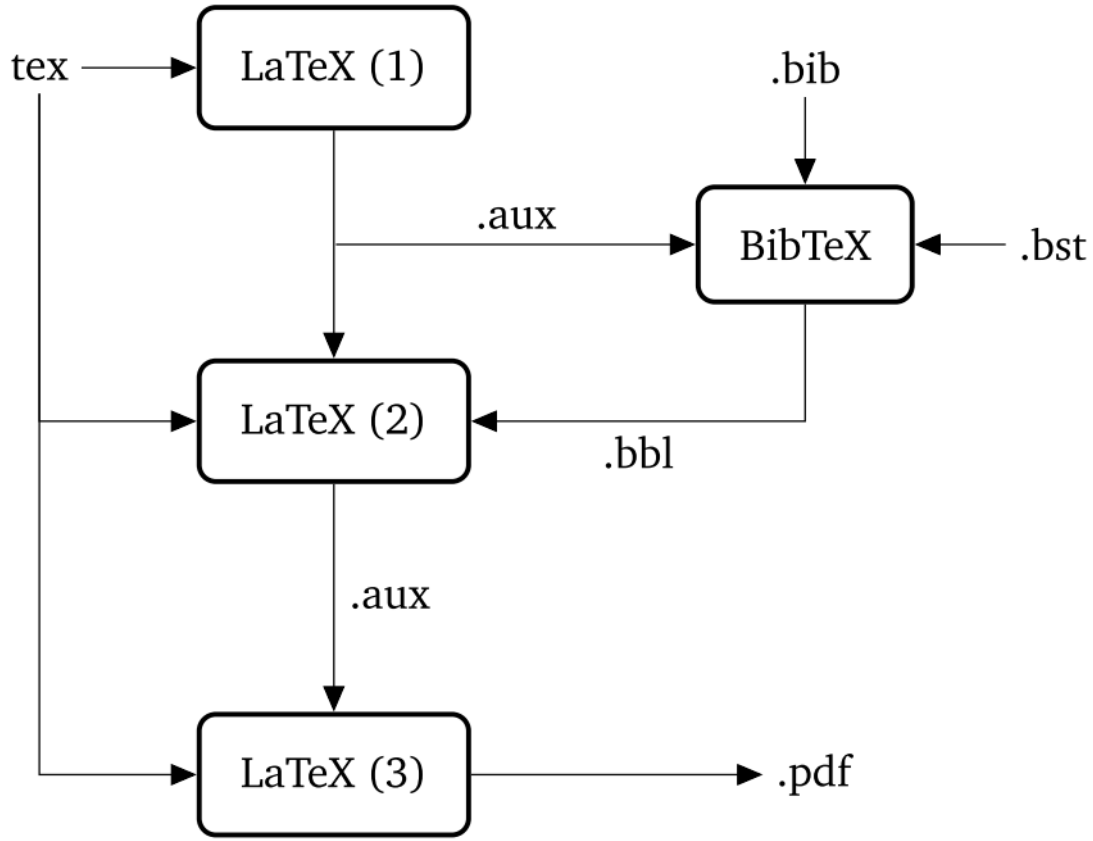
Document with bibliography

```
\documentclass{article}

\bibliographystyle{alpha}

\begin{document}

In \cite{bohring_mapping_2005},
it is explained that...

\bibliography{references}

\end{document}
```



Build Document = LaTeX, BibTeX, LaTeX, LaTeX

Programmaufrufe – Skizze



Reference: Pospiech, Matthias (2011): Bibliographien mit LaTeX mit Zitaten und Nummern Stil. http://www.matthiaspospiech.de/files/latex/vortrag/VortragBibtexBiblatexBiber.pdf , Folie 15

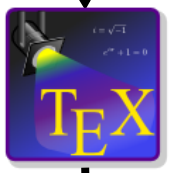
Workflow considerations

- Add references
- Update references

1 BibTeX file containing ALL references!

BibTeX export

- Write text
- Add quotations
- Add citations



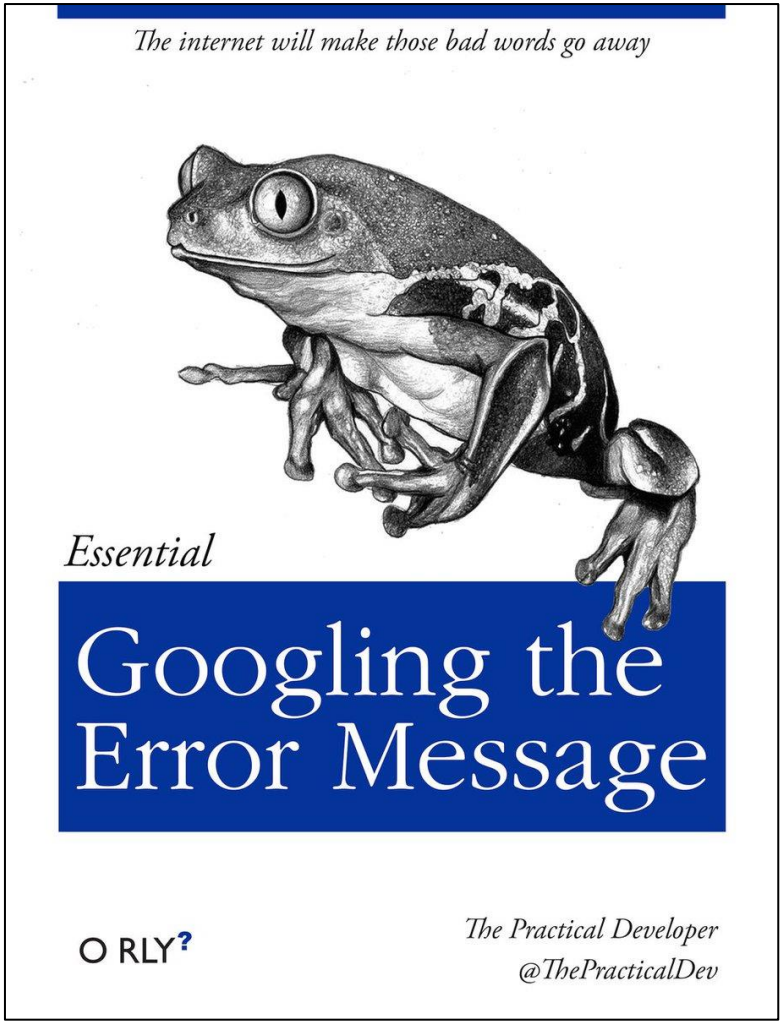
Put ALL the files in the SAME folder

Build routine

- Final output

Handling Errors and Warnings

- Errors after 5 times building are serious and need to be handled:
  - Googling the Error Message
  - http://tex.stackexchange.com/
- Look at warnings and decide whether to ignore and deal with them
- Overfull/underfull boxes are common and mostly negligible but avoid visible over-/underflowing effects



Source of this picture:
https://twitter.com/BecomingDataSci/status/835961594920243200

Extending LaTeX

- Packages with `\usepackage[options]{packageName}`

  for example:

  - `\usepackage{graphicx}`
  - `\usepackage[utf8]{inputenc}`

- `ngerman`, `color`, `listings`, `algorithmic`, `hyperref`, ...

- Define new commands with \newcommand{\key}{replacement}
  - Goals: abbreviations and consistency
  - E.g. blue, bold text for todo's (need color package):

```
\newcommand{\todo}[1]{%
    \textbf{\textcolor{blue}{[#1]}}
}
```

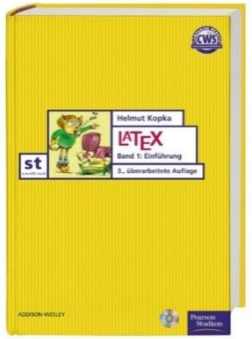
- Possibilities to customize document classes

Literature

- Oetiker et. al.:The Not So Short Introduction to LATEX2ε
  - http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf
- Wikibook : LaTeX

  http://en.wikibooks.org/wiki/LaTeX

- Kopka: LaTeX, Band 1: Einführung
  - ISBN: 978-3-8273-7038-9
  - Pearson Studium



- Schlager: Wissenschaftlich mit LATEX arbeiten
  - ISBN 978-3-8273-7078-5
  - Pearson Studium