

# *Scientific Writing*

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# Outline

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- *Part 1 : Some general thoughts*
- *Part 2 : How to write a scientific paper*
- *Part 3 : How to use LaTeX (basic rules)*
- *Part 4 : The GSI template file*
- *Add-on: Further reading (references)*

# *Part 1*

*Some general thoughts  
at the beginning*

# *It never stops*

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- *Reports for summer schools*
- *Bachelor thesis, Master thesis, PhD thesis*
- *Papers, reviews, ...*
  
- *All different in style, in principle all similar*
- *Difference from presentations: „Personal style“ not appropriate*
- *Reader is used to a certain style and wants to get content with as little work as possible*
  
- *What truly helps: Practise, practise, practise!!!*

# Who is my audience?

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- *„Nobody reads it anyway“ is not true!*
- *Reference, documentation, etc.*
- *Who is meant to read it?*
- *What does the reader know?*
- *What do I want to tell?*
  - *Where to start?*
  - *Which level of detail do I want?*
- *The reader is defined once ...*
  - ... write the name on a paper and put it in front of you*
- *You did great work – let the others know!*

# Start early

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- *Read, read, read: Style*
  - *How was it done by others?*
  - *What do I like?*
  - *Why is it good?*
- *Literature Research: Physics*
  - *What do others write?*
  - *What don't they write?*
  - *What do I need to know?*
  - *Do I understand the basics?*
- *No need to wait until the end, when you start writing*
- *Plan for enough time*
  - *It always takes longer than one thinks*
  - *Consider time for corrections and editorial work*

# Technicalities

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- *Use LaTeX*
  - *Templates*
  - *Standard LaTeX is usually fine*
- *Use Vector Graphics*
  - *Always keep macro, eps, gif/jpg*
- *Use spelling tools ... ;-)*

# *It's all about communication !*

- *The reader is not interested in the process, but in the result*
- *„It's just for....“ is an absolute **NO GO***



## *Part 2*

# *How to write a scientific paper*

# *Step 1: The beginning*

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*The most difficult at the beginning?*

*The beginning !!!*

- *Talk to the supervisors*
- *What is the expectation?*
- *How much background?*
- *Traditions can be very different*
  
- *Main question: How is something related to my work?*
- *Do I only write it because everybody does? Change !!!*

# *The white sheet of paper*

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- *Start with a white sheet of paper and a pencil*
- *No computer*
- *Design a story*
- *Use arrows and buzzwords*
- ***Results in a structure / table of content***
- *What to tell when?*
- *Tell the story to yourself ... does it make sense?*
- *Tell it to somebody else*
- *No story = no talk, no thesis, no paper*

# Step 2: The Art of speaking ...

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## *... and being silent*

- *If you have no idea: You can't write anything  
You have a problem*
- *If you know everything: You have to omit stuff  
You (possibly) have a problem*
- *Greatness by omitting the right stuff*
- *Not good:*
  - ➔ *One page summary in a paper of few pages*
  - ➔ *150 pages text explaining current physics with half knowledge*
- *Should one write stuff one did not understand?*
  - ➔ *You can not write it (very good)*
  - ➔ *You can learn it (even better, helps others, more work)*

# Step 3: Continuity

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- *What is the level of the paper?*
- *This defines how deep to go!*
- *All words not known to the reader MUST be explained if they are important!*  
*Always !!*
- *Abbreviations must be explained!*  
*Always !!*

# Step 4: Patchwork writing

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- *Nobody writes beginning to end:*

*Everybody jumps*

*Writing this — writing that, e.g., include figures / formulas / tables first, continue with their description / discussion etc.*

- *If there is no precise plan when to write what check for consistency (from time to time) at least at the end:  
Structure of paper / thesis = table of content?!*
- *When did I introduce special terms?*
- *Did I explain it at the first time?*
- *Did I explain my abbreviations?*

# *Step 5: Layout*

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## *Typical (,default') structure of a paper*

*Title*

*Author(s)*

*Abstract*

*Introduction*

*Materials and Methods*

*Results*

*Discussion*

*Acknowledgements*

*References (cited literature)*

# Step 5: Layout

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## *The title*

- *Think about something ('brain storming')*
  - *A serious title*
  - *A title for the news*
  - *A title off-the-wall*
  
- *Combine them*



# Step 5: Layout

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## *The page*

- *It is usually better to have images at the top of the page*
- *Avoid confusing page layout*

*Text*

*Image*

*Caption*

*Text*

*Table*

*Caption*

*Text*

# Step 6: Style and Language

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- *Use a clear, reserved language*
  - *Passive*
  - *No 'I'*
  - *Could be 'we'*
- *Don't write in the past*
  - *Exception: measurement, beam time, old stuff*
- *Nobody is asking for literature but:*
  - *No typos*
  - *Grammar can change the meaning*
  - *Problems in style can make it difficult to follow*

# Step 7: Pictures and Tables

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- *Same font*
- *Same style*
- *Big fonts, same size as text*
- *Edit pictures, remove unnecessary stuff*
- *Combine pictures*
- *Discuss and mention pictures in text*
- *Captions:*
  - *What is shown? – Axis and data!!*
  - *What do I see? What shall the reader see?*
  - *Many readers only look at the plots :-)*

# *Step 8: Relationship to the reader*

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- *The reader likes:*
  - *To understand*
  - *To recognize*
  - *To know what is coming and what has happened (sign-posting)*
  
- *The reader likes not:*
  - *Not been taken seriously*
  - *If some knowledge is assumed and others is not*
  - *If it is impossible to understand*
  - *To think that more time is needed to read than it was to write*

# *Step 8: Relationship to the reader*

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- *Introduction to the paper / thesis*
  - *In chapter 1 ... in chapter 2 ...*
- *Introduction to the chapter*
  - *In this chapter this and that will be discussed ...*
- *Brief summary at the end of a chapter*
  - *... After discussing this and that ... in the following ...*
- *Only summarize what you already said*
  - *No new results*

# Step 9: The Corrections

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- *You want to write a good paper*
- *You understand that help is always good*
- *You want to make maximum use of the helper*
- *Recommendation: Corrections in steps*
  - ➔ *Spelling (the computer and/or a friend)*
  - ➔ *Style and grammar (another friend: best, no expert)*
  - ➔ *The expert*

# Step 10: Quotations

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- *What is common?*
- *Consistency check*
- *In papers: check style*
- *Always in the order as in the text*
- *No place holders (‘risky’), better:*
  - *XXX*
  - *„Should be added once I know ”*
- *LaTeX can help you*

# *Emphasize your work / no plagiarism!*

- *It must be clear what is your work!!*
- *Clear separation*
  - *Acquired knowledge*
  - *Own contribution*
- *Different chapters*
  - *Introduction: read*
  - *Everything else: self*
- *In every chapter: **tell clearly what YOU did and clearly indicate & cite the work of others***



# *Part 3*

## *How to use LaTeX*

# Outline

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## *A very short guide to LaTeX*

- *What's this all about? What's LaTeX?*
- *How to type LaTeX commands (basic rules)*
- *Creating and typesetting your document*  
*Basic structure + front matter + main body*

*Thanks to Silmaril Consultants / Textual Therapy Division*

# LaTeX is ...

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- ... a document preparation system for high-quality typesetting*
- ... most often used for technical or scientific documents*
- ... not a word processor (not WYSIWYG !!)*
- ... based on Donald E. Knuth's TeX typesetting language  
(first developed in 1985 by Leslie Lamport)*
- ... pronounced «Lah-tech» or «Lay-tech», to rhyme with «Blech»  
or «Bertolt Brecht» (almost ;-))*
- ... available as free software*

# *LaTeX contains features for:*

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- *Typesetting journal articles, technical reports, books, ...*
- *Large documents containing sectioning, cross-references, tables and figures*
- *Typesetting of complex mathematical formulas*
- *Advanced typesetting of mathematics with AMS-LaTeX*
- *Automatic generation of bibliographies and indexes*
- *Multi-lingual typesetting (e.g. Japanese)*
- *Inclusion of artwork, and process or spot colour*
- *Many more ...*

# LaTeX syntax – the rules are:

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- All LaTeX commands begin with a backslash.  
Example: `\maketitle`
- If a command needs text to work with, it goes in curly brackets.  
`\title{Sample file for your report}`
- If options are used, they go in square brackets first.  
`\documentclass[twocolumn,gsifonts,...]{gsipaper}`
- Space after commands without brackets gets suppressed.  
`Copyright \copyright 2018` → Copyright ©2018  
Better: ... `\copyright{}` 2018 → Copyright © 2018
- Curly brackets are also used to restrict the scope of effects inside them.  
`Some {\tiny little} word` → Some little word

# Four step process

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1) Create document using any plain-text editor with LaTeX controls, e.g. Emacs

2) Save file with a name ending in **.tex** (never use spaces in filenames !!)

3) Typeset and display document using toolbar buttons / menu items of the editor

*Alternative: `pdflatex name.tex` (enter) → `name.pdf`*

4) Make & save any changes needed in the document, i.e. the file with ending **.tex**

# *Part 4*

## *The GSI template file*

*Add-on*

*Further reading*



# Some general references

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- *D. Budker, Some rules of good scientific writing, arXiv:physics/0608246v3 [physics.gen-ph]*  
<https://arxiv.org/pdf/physics/0608246.pdf>
- *Introduction to Journal-Style Scientific Writing*  
<https://www.bates.edu/biology/files/2010/06/How-to-Write-Guide-v10-2014.pdf>
- *Writing a Scientific Research Article*  
<http://www.columbia.edu/cu/biology/ug/research/paper.html>
- *Writing Guidelines for Engineering and Science Students*  
<https://www.craftofscientificwriting.com>
- *Writing about Physics (University of Toronto)*  
<http://advice.writing.utoronto.ca/>
- *And a lot of books ...*

# Some *LaTeX* references

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- *The very short guide to typesetting with LaTeX*  
<http://latex.silmaril.ie/veryshortguide/>
- Important: *guidelines.pdf* + *template.tex* / *template.pdf*  
<http://theory.gsi.de/stud-pro/Internal/ReportBook.shtml> (?)
- *Comprehensive TEX Archive Network*  
<https://mirror.physik.tu-berlin.de/pub/CTAN/>
- *Very helpful website*: <http://www.latex-project.org/>
- L. Lamport: *LaTeX, A Document Preparation System, User's Guide and Reference Manual*, Addison-Wesley Publishing Company, 2<sup>nd</sup> edition (1994)