Scientific Writing

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August 5, 2025

Outline

- *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

- *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?

- *„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

- *Read, read, read… (style)*
  - *How was it done by others?*
  - *What do I like?*
  - *Why is it good?*
- *Academic literature research*
  - *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

- *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

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

- *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 paper, no thesis*

Step 2: The Art of speaking ...

… 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*
- *Omitting the right stuff can be challenging*
- *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

- *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

- *Almost 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

Typical (‚default') structure of a paper

Title

Author(s)

Abstract

Introduction

Materials and Methods

Results

Discussion

Acknowledgements

References (cited literature)

Step 5: Layout

The title

- *Think about something (“brain storming”)*
  - *A serious title*
  - *A title for the news*
  - *A title off-the-wall*
- *Try to combine them*

Step 5: Layout

The page

- *It is usually better to have images at the top of the page*
- *Avoid confusing page layout, i.e. wild mess of text, figure(s), figure caption(s), table(s), table caption(s), mathematical formulas etc.*
- *Templates help … do not change them (much)*

Step 6: Style and Language

- *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: Figures and Tables

- *Same font*
- *Same style*
- *Big fonts, same size as text (follow templates)*

- *Edit figures, remove unnecessary stuff*
- *Combine figures*

- *Discuss and mention figures 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

- *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

- *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 in summaries*

Step 9: The Corrections

- *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)*
  - *Expert(s) in the field*

Step 10: Quotations

- *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

- *It must be clear what is your work!*
- *Clear separation*
  - *Acquired knowledge*
  - *Own contribution(s)*
- *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

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 ...

… 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»

… available as free software

LaTeX contains features for:

- *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:

- *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

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

- *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*
  https://www.columbia.edu/cu/biology/ug/research/paper.html
- *Writing Guidelines for Engineering and Science Students*
  https://www.craftofscientificwriting.org
- *Writing about Physics (University of Toronto)*
  https://advice.writing.utoronto.ca
- *And a lot of books …*

Some LaTeX references

- *An introduction to typesetting with LaTeX by Peter Flynn*
  https://latex.silmaril.ie/formattinginformation/
- *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: https://www.latex-project.org/*
- *L. Lamport: LaTeX, A Document Preparation System, User's Guide and Reference Manual, Addison-Wesley Publishing Company, 2nd edition (1994)*