

Scientific Writing

Gerhard Burau

HGS-HIRe *for FAIR*
Helmholtz Graduate School for Hadron and Ion Research

International Summer Student Program at GSI-FAIR

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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: (almost) 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, in 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 as an Engineering or Scientist (Pennsylvania State University)
<https://www.writing.engr.psu.edu>*
- *Advice on Academic Writing (University of Toronto)
<https://advice.writing.utoronto.ca>*
- *And a lot of other websites ... and books, too!*

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)*