



Universität Hamburg  
DER FORSCHUNG | DER LEHRE | DER BILDUNG

CLUSTER OF EXCELLENCE  
QUANTUM UNIVERSE



# How to write a scientific physics paper

(needless to say: this is very personal view... )

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Presentation Skills Seminar, Summer Term 2024

Jan Louis

## Preamble: Rules of Good Scientific Practice

1. DFG guidelines (new Version 2019)

<https://www.dfg.de/de/grundlagen-rahmenbedingungen/grundlagen-und-prinzipien-der-foerderung/gwp>

2. UHH guidelines (new Version 2022)

<https://www.fid.uni-hamburg.de/satzung-gute-wissenschaftliche-praxis.pdf>

3. DESY guidelines (new Version 2023)

<https://bib-pubdb1.desy.de/record/603803/files/document.pdf>

You should read 1. and 2. or 3. – you signed them !!!

MIN-Faculty / HRA / PHGS offer regularly courses on “Rules of Good Scientific Practice”

(next one: June 10 / 11 <https://www.geventis.uni-hamburg.de/course?course=4325368800737058842> )

(in general: see <https://www.promovieren.uni-hamburg.de/en/min/weiterbildung/gwp.html>)

## Preamble: Rules of Good Scientific Practice

### Important points:

- document the research process and comply with the provisions on the safeguarding and storage of primary data
  - Includes experimental / observational data and computer software
  - Have to be “curated”, i.e. involve “metadata”, so that they can be accessed /used later on
  - Center for Sustainable Research Data Management (ZFDM) offers:  
<https://www.fdm.uni-hamburg.de/en.html>
    - help, advice, etc.
    - storage possibilities
    - regularly courses on research data management

## Preamble: Rules of Good Scientific Practice

### Important points:

- maintain strict honesty with regard to the contributions of partners, supervisors (doctoral candidates), competitors and predecessors
  - Co-author: individual who has made a genuine, identifiable contribution to the content of a research publication of text, data or software. All authors agree on the final version of the work to be published. Unless explicitly stated otherwise, they share responsibility for the publication.
  - Honorary authorship is not permissible.
  - Leadership or supervisory function does not itself constitute co-authorship.

## Preamble: Rules of Good Scientific Practice

### Important points:

- respect third-party intellectual property at all times;  
includes comprehensive citations of all sources
- allow and promote critical discourse in the scientific community;
- comply with ethical standards when conducting surveys and experiments
- .....

## Before you start writing a paper

### ➤ define a reader

this sets the level of the paper since it defines what the readers know (and you do not have to discuss) and what they do not know and therefore you have to explain.

### ➤ start at lower level than originally intended

remember that you have thought about the subject for a long time - the readers have not. They also know much less about the subject than you can imagine -> remind them of background material

### ➤ make an effort to write it as clearly as you can

assign some extra time for it, do not rush, this is well worth it! you want as many readers as possible!

## The Title and Abstract

### ➤ Title

- choose an informative and interesting sounding title
- avoid a question or a too technical title

### ➤ Abstract

- summarize the content of the paper as concisely and clearly as possible

## The Introduction

### ➤ This is the most important chapter!

- it is read by all readers
- determines the first impression
- should motivate the readers to continue reading

### ➤ Introduce your work - not some general subject

The readers should learn (in words)

- what is being done,
- why it is done,
- what the results is
- before that introduce (in words) the concepts necessary for this discussion



## The Introduction

### ➤ relate it to the existing literature / current research

state:

- what was known in the literature before your work
- how your work relates to the literature
- which perspectives result from your work

### ➤ further points of an introduction

- present organization of paper
- do not introduce subjects which are not needed later on
- give the reader reasons to read the paper
- make it sound interesting
- avoid jargon

## Section 2

### ➤ can be a further introductory chapter

set the stage for later sections with more details of known material,  
do not copy verbatim from another source but adjust to your needs  
danger: readers get bored as they might already know the material

### ➤ make it stringent

do not introduce/discuss subjects which are not needed later on

### ➤ alternative: start the topic of the paper right away

advantage: the reader knows why the concepts are introduced,  
introduce further background material as you go along or in appendices.

### ➤ avoid having two „review“ sections

altogether the review part should not be longer than the new/original material

## The body of the paper

- generically includes several sections with your original research
- can be useful to start with a simple/clear case and develop generic situation later
- do not loose the readers in early sections by being too abstract or fancy
  - do not insult the readers by being too elementary or too fancy
- put emphasis on new / original material not on review

## The body of the paper

- be as detailed as you can on new / original material
- think about appendices if it gets too technical
  - give readers the choice to skip some material in a long text
  - do not force them to read it cover to cover
- frequent summaries

especially in a long text it can be useful to summarize from time to time

## Conclusion and Outlook

- mandatory in a long paper (like a thesis)
- summarize what has been done and the results
  - there are readers who only read introduction and conclusion
- give an outlook about possible further projects and research

## Appendices

### ➤ appendices should contain:

- additional technical material
- additional review material

### ➤ advantage:

reader can decide what to read or skip

### ➤ if everybody has to read the appendix to understand the paper move it to the main text

## References

### ➤ part of good scientific practice

- „...practising strict honesty with regard to the contributions of partners, competitors, and predecessors ...“
- cite everything which is not your own work!

### ➤ cite the original papers and not only the one you used and learned it from

### ➤ Need to order: alphabetically or as they are called in the text

### ➤ make them uniform

display in a similar/uniform style, use initials, not first names

### ➤ always give the published reference

## The process of writing

### ➤ the steps:

- first write a rough but complete draft
- then decide about the order of the sections
- then decide about the order of the paragraphs
- then polish the paragraphs

### ➤ write it as clearly as you can

almost as important as the computation - your work has to be understood

### ➤ make it for the readers as easy as possible

- explain all notation
- explain (most) steps in (new) derivations



## Final remarks

- **number all equations**  
makes it easier to communicate later on
- **make an effort that the paper looks `nice`**  
avoid the impression of a quickly or sloppily written text -> the reader might also not trust the eqs.
- **Layout - orient yourself at professional journal articles about:**
  - spacing and indentation of paragraphs
  - format of equations
  - format of references
- **proofread and spell check at the end**

## Special remarks for writing a thesis

- strongly focus on your own work – this might differ from your published papers
- state clearly your own contribution if it is based on joint work
- §8(3) MIN Promotionsordnung (<https://www.promovieren.uni-hamburg.de/min/promotion/pdf-promotion/20180502neuf-promo-min.pdf>)

Bei Dissertationen, die in Zusammenarbeit mit anderen Wissenschaftlerinnen oder Wissenschaftlern entstanden sind, muss der Anteil der Doktorandin oder des Doktoranden eindeutig abgrenzbar und bewertbar sein. Die Doktorandin oder der Doktorand ist verpflichtet, ihren oder seinen Anteil bei Konzeption, Durchführung und Berichtsabfassung im Einzelnen darzulegen.

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In the case of dissertations produced in collaboration with other academics, the doctoral candidate's contribution must be clearly definable and assessable. The doctoral candidate is obliged to explain in detail his or her contribution to the conception, implementation and drafting the work.

## Special remarks for writing a thesis

- cite your papers the thesis is based upon
  
- discuss with your supervisors:
  - stay at  $O(100)$  pages
  - option: design it to complement your papers
  - option: design it to emphasize your own contribution of the papers
  
- “have an eye on the second referee”

## Plan of the seminar

- 05.04., JL: „How to write a scientific paper“
- 12.04., JL: „How to give a scientific talk“
- 19.04., no seminar
- 26.04., Participant talk (20+5)
- 03.05., Participant talk (20+5)
- 10.05., no seminar
- 17.05., Participant talk (20+5)
- 24.05., no seminar

## Plan of the seminar

- 31.05., Participant talk (20+5)
- 07.06., Participant talk (20+5)
- 14.06., Participant talk (20+5)
- 21.06., JL: „How to do a job interview“
- 28.06., Job interviews
- 05.07., Job interviews
- 12.07., Job interviews