

How to write a scientific physics paper^a

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Seminar: Presentation Skills, Winter term 2015/16

^aNeedless to say, this is a very personal view... .

Rules of good scientific practice^a

Recommendation 1

Rules of good scientific practice shall include principles for the following matters (in general, and specified for individual disciplines as necessary):

- fundamentals of scientific work, such as
 - observing professional standards,
 - documenting results,
 - consistently questioning one's own findings,
 - practising strict honesty with regard to the contributions of partners, competitors, and predecessors,
- cooperation and leadership responsibility in working groups,
- mentorship for young scientists and scholars,

^ahttp://www.dfg.de/foerderung/grundlagen_rahmenbedingungen/gwp/

Rules of good scientific practice

Recommendation 1 (continued)

- securing and storing primary data (recommendation 7),
- scientific publications (recommendation 11).

Recommendation 7

Primary data as the basis for publications shall be securely stored for ten years in a durable form in the institution of their origin.

Recommendation 11

Authors of scientific publications are always jointly responsible for their content. A so-called “honorary authorship” is inadmissible.

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 only 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

Chapter 2

- **can be further introductory chapter**

set the stage for later sections with more details of known material

do not copy it verbatim from another source but adjust it to your needs

danger: readers get bored since they already know the material.

- **make it stringent**

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

- **alternative: start the topic right away**

advantage: the reader knows why the concepts are introduced

introduce background material as you go along or in appendices.

- **avoid having two ‘review’ sections.**

altogether the review 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 the simple/clear case and develop generic situation later
- do not loose the readers in early sections by being too abstract/fancy
 - do not insult the readers by being too elementary or too fancy
- put emphasis on new/original material not on review
 - be as detailed as you can on new/original material

The body of the paper

- **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
Recommendation 1
... 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
- 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
- avoid “et.al.”

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 equations

- **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**
might differ from published papers
- **state clearly your own contribution if it is based on joint work^a**
- **cite your papers the thesis is based upon**
- **stay at $\mathcal{O}(100)$ pages**
- **option: design it to complement your papers**
- **“have an eye on the second referee”**

^a§7(3) 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.

<https://www.min.uni-hamburg.de/forschung/promotion/verfahren.html>