How to write a scientific paper

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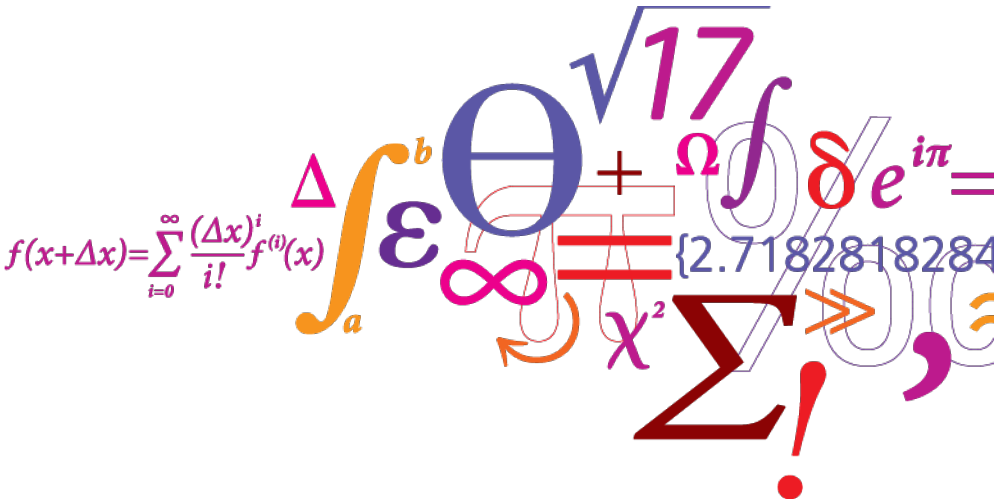

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Readers are busy (and stressed)

- They have very little time to read and understand your work
- It must be VERY clear from the start
  - Why did you use your precious time doing this
    - There are so many other things you could do
  - What did you do
  - What did you find out
- Everything that the reader can not understand is per definition *wrong*

Where to start

- You got to have results (unless it is a reveiw)
  - You compares something with something else
  - E.g tested something under two different conditions
- Good results have a p-value
  - Required for most types of work in most journals

Start with Figures/Tables

- Make them in journal quality
  - Readable even when scaled down (to 5x5cm)
    - BIG labels
    - **THICK** lines
- Figures/tables must be self contained so they are readable on their own
  - Some (=All) readers are lazy and will only look at the figures if they can get away with it

Captions vs text

Figure/Table captions

- First sentence of caption – what is it all about
  - E. g. development of X over time
- Explain every element – and all abbreviations
  - Figures
    - What is on the x-axis (what to the abbreviation mean)
    - What is on the Y axis
    - What is every line type, point type, color etc.
  - Tables
    - Rows (what do every row represent)
    - Columns (what to every column represent)
  - Did you explain all abbreviations?
  - Can you do all of the above in half a line – probably not – 4-5 are more likely

Results text

- Start with writing one sentence per figure table explaining what the reader should learn from it
  - Conclusive (better)
    - Figure 1 show that X increase as a function of Y
  - Descriptive (ok but could it be conclusive)
    - Figure 1 show X as function of Y
  - If you can not write something, maybe it should be taken out
  - All figures/tables should be referred to in the main text

Results

- Results often starts with a sentence/paragraph explaining what was done
  - If it is short it is OK it overlaps with **Methods**
    - if it is longer move details (and other boring stuff) to **Methods**
  - Keep minimal Methods like descriptions if they are important for readability
    - so the reader do not have to flip back and for the between results and methods all the time
- Fill in more description as needed between figure/table references

I have 50 very similar figures what should I do

- Show one of as an example
- Use that to show what the most important feature is
- Show that feature from each figure in one figure
- You could also move everything to Appendix/ Supplementary material, but realistically
  - Will anyone look at it?

Grumpy old scientist

- In a scientific paper each sentence should either end with
  - a reference
    - Someone else have shown this
  - Or a p-value
    - I have shown this
- Everything else is just bla bla

Methods

- Describe how the (computational) experiments were done in a detail so someone else who is “skilled in the art” (= as smart as you were when you started in this field) can reproduce it

Methods vs Results

- What goes where?
- Interface difficult
  - How was it done
  - What was done

  Methods
  - What was the result

  Results
- "What was done" is in the interface between Methods and results
  - Move all the long (and boring) details to methods
  - Keep a minimum in Results to help with readability

Introduction

- Not a text book
- Only include what is needed for someone at your level (before you started this work) to understand the rest.
- Cut off unnecessary branches early
  - E.g. The immune system contains branches A which do X and B which do Y. A is divided into …
    - Write no more about B if it is A which are relevant to the work

Introduction

- Refer to the most relevant prior work that the current study is build on/competes with (+ to those who will referee your paper)
- End with a short summary of that will be done (but no results – that is a spoiler)
- E.g. In this paper we will investigate if X increases as a function of Y

Introduction

- Remember to make it clear
  - why you do this
    - What is the problem you try solve
    - Why is it important
  - why you do it like this
    - Explain why this is the most likely/best way of solving the problem

Sentences

- Keep them short
  - Use lots of “.”
- Start sentence with main conclusion, and then come with the exceptions later in the sentence

Discussion

- Discussion means
  - You discuss what is the similarities/differences between **your findings** and those published from people trying to do **similar things**
- It is often good to start you Discussion with
  - One sentence or paragraph (not more) summarizing your main results
  - E.g. In this work we found that the world is flat. Galileo concluded from his studies that the world is round. The difference may be due to …

Discussion

- End the Discussion with an outlook.
- What is the next thin to look at
- How will the findings in this work change the world (remember not to oversell it (too much))

Abstract

- The whole paper condensed down to ~250 words.
  - Why did you do it (Background)
  - What did you do (Methods)
  - What did you get out of it (Results)
    - one sentence per p-value
  - How will it change the world (Outlook)

Order of Writing

- Can Kesmir: I all ways tell my students to write in the order
- R M I D A
- And now I meet a Nobel Price winner who said the same thing
- Ole: Subdivide Results (R) into
  - Figures/Tables
  - Captions
  - Rest of results text

Why was a given method used

Thesis is more than a sum of papers

- Intro
- Gluing together
- 1 page chapter intros
  - Good place for the “real reasons”

References

- Grumpy old man
  - If I find one error, like
    - “.”, where it should be a “,”
  - I stop reading the paper, because if care were not taken in the reference section, how can I trust the results section?

References

- Use systematic method, author-year, or numbers
- Use software for it
- You may initially insert PMID numbers in text and when last version is made replace with proper links

Grumpy old scientist

- If there is an error in the reference list
  - Inconsistent style
    - Using “.” and “,” inconsistently
- Then the author have probably also been sloppy with the results, so they can not be trusted and all further reading is pointless

Questions