

Writing scientific papers Based on Whitesides' Group (Harvard research group)

Whitesides, G. M. (2004). Whitesides' Group: Writing a Paper. *Advanced Materials*, 16(15), 1375–1377. doi:10.1002/adma.200400767

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What is a scientific paper?

- *“Organized description of hypothesis, data and conclusions intended to instruct the reader”*
 - Interesting and unpublished is equivalent to non-existent!
- The goal is to formulate and test hypotheses, draw conclusions and teach conclusions
- We also plan a research!

The outline

- Carefully organized and presented set of data, objectives, hypotheses and conclusions
- Once you have your outline, you just have to fill in the blanks

I did some tricky thing when I directly took the outline of a previous work

Both works are close in content and share structure (systematic map)

Build an outline

- Answer basic questions
 - Why do I do this work?
 - What does it mean?
 - What hypotheses did I mean to test?
 - What ones did I actually test?
 - What are the results?
 - What is new?
 - Etc.

The three major steps

Step 1: Introduction

- Why did I do the work?
- Motivations and hypotheses

Step 2: Results and Discussion

- What was measured?
- What are the results?
- How the compounds are made and characterized?

Step 3: Conclusions

- What does it all mean?
- What hypotheses were proved and which one disproved?
- What did I learn?
- Why does it make a difference?

Finer scale

- Focus on **organizing data** not writing real data!
- Design the tables, graphs, schemes, equations, etc. to understand easily
- Compact everything regarding there is a flow of thinking

Iterations vs Completeness

- No project is ever complete
- Don't wait until the data is complete for writing an outline
- Go through small iterations instead of creating definitive works

Concreating 'The outline'

- Title
- Authors
- Abstract
- Introduction
- Results and discussion
- Conclusions
- *Future work*
- Experimental

Do not write it until you finish your paper!

Goal – Opening sentence should state the goal

Justification – Why is important?

Background – Who else did that?

Guidance

- What should the reader watch,
- interesting points, strategy

Summary – Main conclusions expected from results

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Usually combined and separated by subheadings based on interests

Synthesis – What other works discovered, mention, etc.

Characterization of products – Others strength and weakness

Characterize your product – Your strength and weakness

How you measure – Include explanation of units, processes, etc.

Results details

Trick!!

Everything should be able to be summarized in figures, tables, equations and schemes without losing important content

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List of **short sentences** explaining what happened!

- Where we started to where we arrived
- What do we win, what do we lose

Do not repeat results section unless emphasis is needed

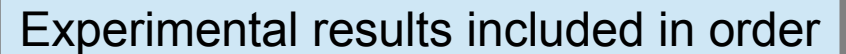
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Regarding **some problems**, what is the **next step**?

Concreating 'The outline'

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- Experimental



Experimental results included in order

Have in mind...

- To **order by importance** not chronological
- Start with failures and finish with success is **wrong approach!!**
 - The reader don't care most of the times how you arrived to your big results
 - Short papers are easier to read!

Bad VS Good style:

Style means easy

- ATP formation *VS* formation of ATP
- This *VS* This formation
- Water produces reaction *VS* Water produced a reaction
- It was observed that the solution turned red *VS* The solution turned red
- The yield was higher using bromine *VS* The yield was higher using bromine than chlorine
- My own style *VS* Predefined one

Learnt lessons

- **Self-contained** is a good idea but you have to balance
- Be careful with using **several documents** for storing the same information because there may rise mistakes
- **Don't leave work for tomorrow** because tomorrow you will **not understand** what you did
 - So you should write for understanding later
- Give your outlines and texts to different people

Learnt lessons

- Every chart, table, etc. must **have a purpose**, a meaning
 - In other words, it should answer a question
- Don't use complex english and don't complicate your life when writing
 - You don't need to write a novel!
 - Simple, easy to understand and complete
- Don't write for yourself, write for your mother, uncle, dad, best friend, etc.
 - Later on, you always can delete obvious information in your field of research