How to Write a Scientific Paper

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Types of scientific communication

• Research article
• Review article
• Editorial
• Letter, Commentary
• Dissertation
• Preprint
• Conference report
• Book; Book chapter
• Patent

Research paper vs Review

• Research articles, called primary sources, provide direct or firsthand evidence about an experiment, event, object, person, or work of art and are. They have a Materials & Methods section (it could be called just “Methods” or “Experimental”) that describes how the experiments were performed.
• Review articles are secondary sources, as they describe, discuss, interpret, comment upon, analyze, evaluate, summarize, and process primary sources. They usually DO NOT have an experimental section.

Organization of a research paper

• Title (Every word is important)
• Abstract (Describes the essence of the paper)
• Introduction (What was the problem?)
• Materials and Methods (How did you study the problem?)
• Results (What did you find?)
• Discussion (What do these finding mean?)
• Conclusions (Will be stated three times: in the Abstract, the Introduction, and the Discussion)
• References (Cite relevant literature)

What is a good Title?

The title should be the fewest possible words that adequately describe the content of the paper.

Which of these titles are good?
• “Action of antibiotics on bacteria”
• “Preliminary observations on the effect of certain antibiotics on various species of bacteria”
• “Action of Streptomycin on Mycobacterium tuberculosis”
• “Action of various antifungal antibiotics on Candida albicans and Aspergillus fumigatus”

What is a good Abstract?

• An abstract is a summary of the information in a document
• Enables readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests and to decide whether they need to read the whole document.
• Should define clearly what is dealt with in the paper
• Should never give any information or conclusion that is not stated in the paper
• Should not include references and literature review
Writing the Abstract

1. State the principle objectives and scope of the investigation
2. Describe the methodology employed
3. Summarize the results
4. State the principal conclusions

The Title and the Abstract should be written after the paper is written.

How to write the Introduction?

• Present clearly the nature and scope of the problem investigated
• Review the pertinent literature to orient the reader
• State the method of investigation (sometimes, explain the reasons for the choice of a particular method)
• State the principal results of the investigation

How to write the Materials and Methods section

• Include enough information must be given so that the experiments could be reproduced by a competent researcher
• Defend your choice of methods
• Include exact technical specifications and quantities of materials
• Use headings
• Do not mix it with the results section

How to write the Results section

• Give an overall description of the experiments; provide “the big picture”, without repeating the experimental details included in the Materials and methods section
• Present representative data rather than endlessly repetitive data
• Strive for clarity
• Avoid redundancy (avoid saying something that is explained by the figures)

“How the compulsion to include everything, leaving nothing out, does not prove that one has unlimited information; it proves that one lacks discrimination.”
Aaronson (1977) Style in scientific writing. Current Contents, No 2, 10 January, pp 6-15

How to write the Discussion

• Present the principles, relationships, and generalizations shown by the Results (discuss, do not recapitulate the results)
• Point out any exceptions or any lack of correlation, and define unsettled points
• Show how your results and interpretations agree (or contrast with previous published work)
• Don’t be shy; discuss the theoretical implications of your work, as well as possible practical applications
• State your conclusions as clearly as possible
• Summarize your evidence for each conclusion

References:

How to prepare the literature cited

• List only significant, published references
• Do not clutter the literature cited with references to unpublished data, papers in press, theses, and other secondary material.
• Check all parts of every reference against the original publication
• Use a bibliographic management program such as EndNote Online, Zotero, or Mendeley. If you want to learn how to use EndNote and Zotero, look at the instructional materials posted at http://lib.guides.umd.edu/chemistryresources/instructions