

WRITING A RESEARCH PAPER

كتابة ورقة عمل

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“ . . . the preparation of a scientific paper has less to do with literary skill than with *organization*. A scientific paper is not literature.” (Robert A. Day ; *How to Write and Publish a Scientific Paper*)



BEFORE WRITING

- Right from the beginning of your project, think about experiments in terms of future papers, especially the **FIGURES**.
- For example, if you are doing immunoprecipitation studies imagine a **future figure** as you load your samples on the gel. Arrange the control, experimental and marker samples in the optimal sequence for a future figure so you don't have to go back and redo it.
- For photomicrographs, think about the best magnifications and orientations to show the important features.



The IMRAD Format for Scientific Papers

- **Introduction:** What was the question?
- **Methods:** How did you try to answer it?
- **Results** What did you find?
- **Discussion** What does it mean?



The Front Matter

- Title
- Authors
- Abstract



Title

- The fewest possible words that adequately indicate the contents of the paper
- Should not include extra words, such as “a study of”
- Should be specific enough but not overly narrow



Authors

- Those with important intellectual contributions to the work
- Often listed largely from greatest contributions to least
- Head of research group often is listed last
- Important to list one's name the same way from paper to paper



Abstract

- An abstract is a succinct (one paragraph) summary of the entire paper
- It should be possible to determine the major points of a paper by reading the abstract
- Normally should not include figures, tables, references
- Although it is located at the beginning of the paper, it is easiest to write the abstract after the paper is completed



The Core of the Paper

- Introduction
- Methods
- Results
- Discussion



Introduction

The Introduction should

- Describe the question tested by the experiments described in the paper.
- Explain why this is an interesting or important question.
- Describe the approach used in sufficient detail that a reader who is not familiar with the technique will understand what was done and why



Materials and Methods

- The Materials and Methods section should succinctly describe what was actually done.
- It should include description of the techniques used so someone could figure out what experiments were actually done.
- The details of a published protocol do not need to be reproduced in the text but an appropriate reference should be cited – e.g., simply indicate “were done as described by Hughes et al.



Results

- Once you figure out what your data means, design your presentation to illustrate those ideas as clearly as possible.
- If a result is simple, recording it in the text is sufficient.
- For more complex results, tables or figures will be needed if the exact number for each data point is important? (favours a table) or is the trend or pattern between data points that's important? (favours a figure).
- A table or a figure should be titled and captioned in such a way that it is understandable on its own.



Results

- Should be simply stated (past tense).
- Common errors: discussing results, missing data.



DISCUSSION

- Often should begin with a brief summary of the main findings
- Present the principles, relationships, and generalizations shown by the Results
- Include a beginning, middle, and end
- Write in present tense, active voice—except for results, which are described in past tense
- Discuss other studies only in the context of your results



End Matter

- Acknowledgments
- References



Acknowledgments

- A place to thank people who helped with the work but did not make contributions deserving authorship
- Permission should be obtained from people you wish to list
- Sometimes the place where sources of financial support are stated



References

- Importance of accuracy
- Existence of various reference formats
- Availability of citation management software (examples: EndNote, Reference Manager)



Start by drafting whatever part of the paper you find easiest to prepare. (Many people find it easiest to start with the methods section.)



Thank you

