

Scientific Writing 101

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Writing Well for Science

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What is covered in Lecture 1:

The basic structure of a research paper

How to design illustrations for a paper

How to prepare an outline

The craft of scientific writing. Michael Alley.

About scientific writing:

Scientific writing is hard work.

Scientific writing is not science.

Scientific writing is a craft.

It is a skill that must be developed through practice, practice, and more practice.

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How to find a **strong** title for a paper:

- **Being precise** (using the right words and appropriate level of accuracy);
- Using no more than three or four details;
- **Avoiding being too long;**
- **Avoiding unfamiliar abbreviations.**

The craft of scientific writing. Michael Alley.

What is the abstract for:

The abstract is to help readers to decide whether or not they need to read this paper.

“Please be good enough to put your conclusions and recommendations on one sheet at the very beginning of your report, so that I can even consider reading it.”

---Winston Churchill

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About the abstract

When you cannot find a concise title to separate your work from everyone else's work, you can use the abstract to do so.

The repetition between the title and abstract is not a **redundancy***

Note: If you need an abbreviation, define it first.

*A redundancy is a **needless repetition**.

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How to write an introduction:

An introduction should answer the following questions:

1. What exactly is the study about?
2. Why is the study important?
3. What is needed to understand the work?
4. How will the work be presented?

Note: If you need an abbreviation, define it first. (The one defined in the abstract does not count.)

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Middle of a research paper:

- 1) Choose an appropriate strategy to describe your research;
- 2) Create sections and subsections.

Considering parallelism

Ending of a research paper:

1) Conclusions

Conclusions generally include a list of the key results from the paper's middle, a discussion and a future perspective on the work.

2) Back matter

It includes appendices and a bibliography.

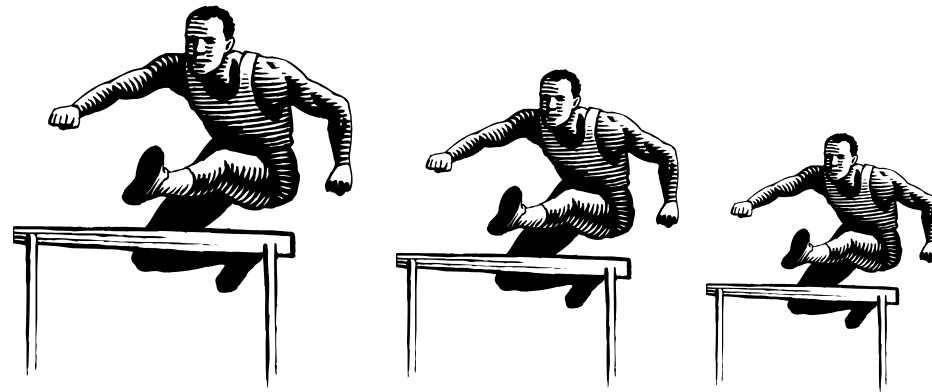
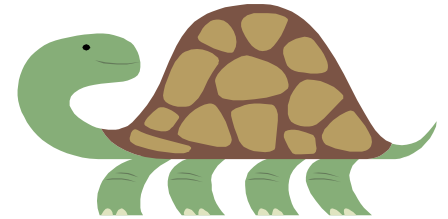
Ending of a research paper (cont'd):

1) Conclusions

- Do not bring in new results or new ideas;
- Do not end the paper with a negative statement about the work;
- Do not define abbreviations again;
- Avoid being too long (about 5%-10% of the length of the main text).

Actually sitting down to write:

- Getting in the mood;
- Writing the first draft;
- Revising, revising, revising;



- Finishing (round 1).

Step 1: Designing and refining figures

- Design each figure by highlighting the features you want to share with your readers;
- Keep only what's necessary (panels, shadings, contours, labels, and writings);
- Arrange all the figures in a logic way.

Test: You should be able to give a 15-min talk using these figures alone.

Illustration: Being Precise

Common mistake: A figure is much more complex than the text.

"Everything should be as simple as it can be, yet no simpler."

---Albert Einstein

Illustration: Being Clear

A good figure has a well-written caption, which begins with a title phrase.

Test: A well-written caption should provide enough information to stand alone.

Illustration: Being Fluid and familiar

- Match the information in the text with that in the illustration;
- Use familiar units;
- Use consistent layout.

Step 1.5: Write detailed captions

- Write down everything you want to say about a particular figure in the paper in its “extended” caption;
- Revise each caption until its text reads smoothly and logically.

Note: You will move much of this writing to the main body later.

Step 2: Using an outline

I. Introduction

II. Methodology

III. Results

IV. Summary and discussion

Step 2: Using an outline (cont'd)

I. Introduction

1.0 Opening paragraph

1.1 Background (pubs)

1.2 Present research

Note: Do not “mix” your own (published) results with other people’s results, which can really upset some reviewers.

Step 2: Using an outline (cont'd)

I. Introduction

1.0 Opening paragraph

1.1 Background (publications)

1.1.1 Observational background

1.1.2 Theoretical background

1.1.3 Modeling background (pubs)

Step 2: Using an outline (cont'd)

II. Methodology

2.1 Data

2.1.1 Atmos. data

2.1.2 Air-sea flux data

2.1.3 Ocean data

2.1.3.1 Data used for assimilation

2.1.3.2 Data used for validation

2.2 Models (cont')

Step 2: Using an outline (cont'd)

II. Methodology

2.1 Data

2.2 Models

2.2.1 Model basics (equations, etc.)

2.2.2 Forcing field

2.2.3 Basin, resolution, and boundary conditions

2.2.4 Initial conditions

2.2.5 Output sampling and averaging

Step 2: Using an outline (cont'd)

III. Results

3.1 Main run

3.1.1 Mean state

3.1.2 Seasonal variability

3.1.3 Interannual variability

3.2 Sensitivity to winds

3.3 Sensitivity to mixing

...

Step 2: Using an outline (cont'd)

IV. Summary and discussion

4.1 Summary

4.2 Discussion

4.2.1 Unresolved issues

4.2.2 Future work

Note: Avoid ending a paper with a list of weaknesses of the research.

How to revise:

- You need to obtain some distance from the current version.
(Go for a long walk, go have a drink...)
- You have to become a good reader, if you want to become a successful reviser.
- You should solicit criticism of your writing.

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