How to write a scientific paper

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Some helpful resources!

1) http://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/118519636#bookContentViewAreaDivID

   --good description of what different sections of a paper need to accomplish

2) https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously
3) --part of a series from an author/reviewer/editor on how to get started on your paper

3) http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3009394/pdf/pro0019-2261.pdf

   --"The Art of Writing Science" by Kevin Plaxco--excellent paper on how to develop your scientific writing

4) http://www.americanscientist.org/issues/pub/**the-science-of-scientific-writing**/1

   --excellent article discussing specifics of structure in scientific writing

- When am I ready to write my paper?
- What do I write?
- Where do I start?
- How do I know when I'm done?
- Where do I send my paper?
- What happens after I've submitted my manuscript?

When am I ready to write?

YOU NEED TO BE ABLE TO MAKE A STORY

--You can (should) think about your story before you're ready to write the paper

--The "story" usually starts with a question

--Ultimately, you need to let your data drive the story—think about what figures you have and would need

--Your story is unlikely to follow the chronology of how you did your experiments

When am I ready to write?

- YOU NEED TO BE ABLE TO MAKE A STORY

- But there are different types of stories:
  --short communication/letter
  --regular research paper
  --comprehensive paper

Should you plan for a specific journal????

What do I write?

Most scientific articles have the same central sections:

Introduction
Materials and Methods/Experimental Procedures
Results
Discussion

But it's not usually a good idea to start at the beginning when you write.

Where do I start?

- Outline your story (one approach)
  - Start with a broad outline, thinking about the question you are starting with and where you want to end
  - Gradually make your outline more detailed—what points will you need to make (what data will you need to present) to build your argument
  - Outline will eventually contain sections of your paper

Where do I start?

- Figures—let the data drive your story
- Results section—write around your figures
- Discussion—puts your paper in context
- Materials and methods—write after you know what is going to be in your final figures
- Introduction—presents the question you are addressing and placing your paper in your field
- Abstract—write after other sections are complete


NO, NO, IF YOU MAKE THE PAPER TOO EASY TO READ, EVERYONE WILL KNOW HOW YOU GOT THE RESULTS!

Results section

- Relates experiments to your larger question
- Should present experimental design for each figure, but without tremendous experimental detail
- Objectively describe results
- Can include some interpretation/conclusions, but much of this goes in Discussion

Discussion section

- Discusses your results as a whole in the context of your question—more detailed analysis of results
- Points out what your results are contributing to the field
- Can think of a “pyramid”—starting from your detailed results and moving out in breadth to end with how your work fits into your field
- Sometimes good to end with remaining questions or next steps

Materials and methods

- Should allow readers of your paper to reproduce your experiments

- Should NOT be required for readers to understand your results and discussion

  (Many people won't read this section)

- As a general rule: reference established methods, but describe new or substantially revised methods in more detail

Introduction

- Makes the question you are a addressing clear
- Can convince reader to continue reading your paper
- Could be thought of as inverted pyramid: most general information to more specific information to your project
- Purpose is NOT to show everything you know about your field (you can do that in your thesis!). Should be unbiased but be directed toward framing your question/results.

References

- Format is dependent on journal
- Use a reference manager (Endnote or others)
- Know what is actually in the papers you reference!

  Try to find source references. Don't cite a paper for a reference that is in that paper.
- When in doubt, reference—Introduction and Discussion will generally have lots of references; Materials and Methods may have quite a few, too.

Abstract


WHAT IS IT?
YOU SAID TO DO AN ABSTRACT
Statistically-Funny.blogspot.com

Abstract

- Very important part of paper—will be on PubMed. NEEDS TO CAPTURE INTEREST.
- Avoid a lot of background, but make your question clear.
- General experimental approach and most important results.
- Requires clear, concise writing—have others outside your lab read it for clarity.

Title

- Current trend is toward titles that describe results: “The RAVE complex is an isoform-specific V-ATPase assembly factor”

- Older papers had more general titles: “Biochemical characterization of yeast V-ATPase”, “A study of…”

- Short as possible, but informative

How do I know when I'm done?

Expect many revisions as you write your paper

Get feedback from others outside your lab, even after all authors are in agreement.

Recheck "Instructions to Authors" for the journal where you will submit your paper.

A clear, well-written paper is worth the effort!!!

- The most important rule is simple: ignore any and all other rules if doing so makes the paper easier to read. Writing the clearest, easiest to read papers possible is the one-and-only goal

From “The Art of Writing Science”

Scientific writing is an art!

- Make your reader's job as easy as possible
- Try to avoid passive voice
- Be careful about sentence structure—if you use long sentences, then need to be very clear
- Watch out for lab jargon, unnecessary abbreviations
- Try to notice papers that you find exceptionally clear when you are reading—look at what makes them clear
- *Improving your writing is a life-long effort.*

Where do I send my paper?

- Complicated issue—many factors to consider:

  --Impact factor???

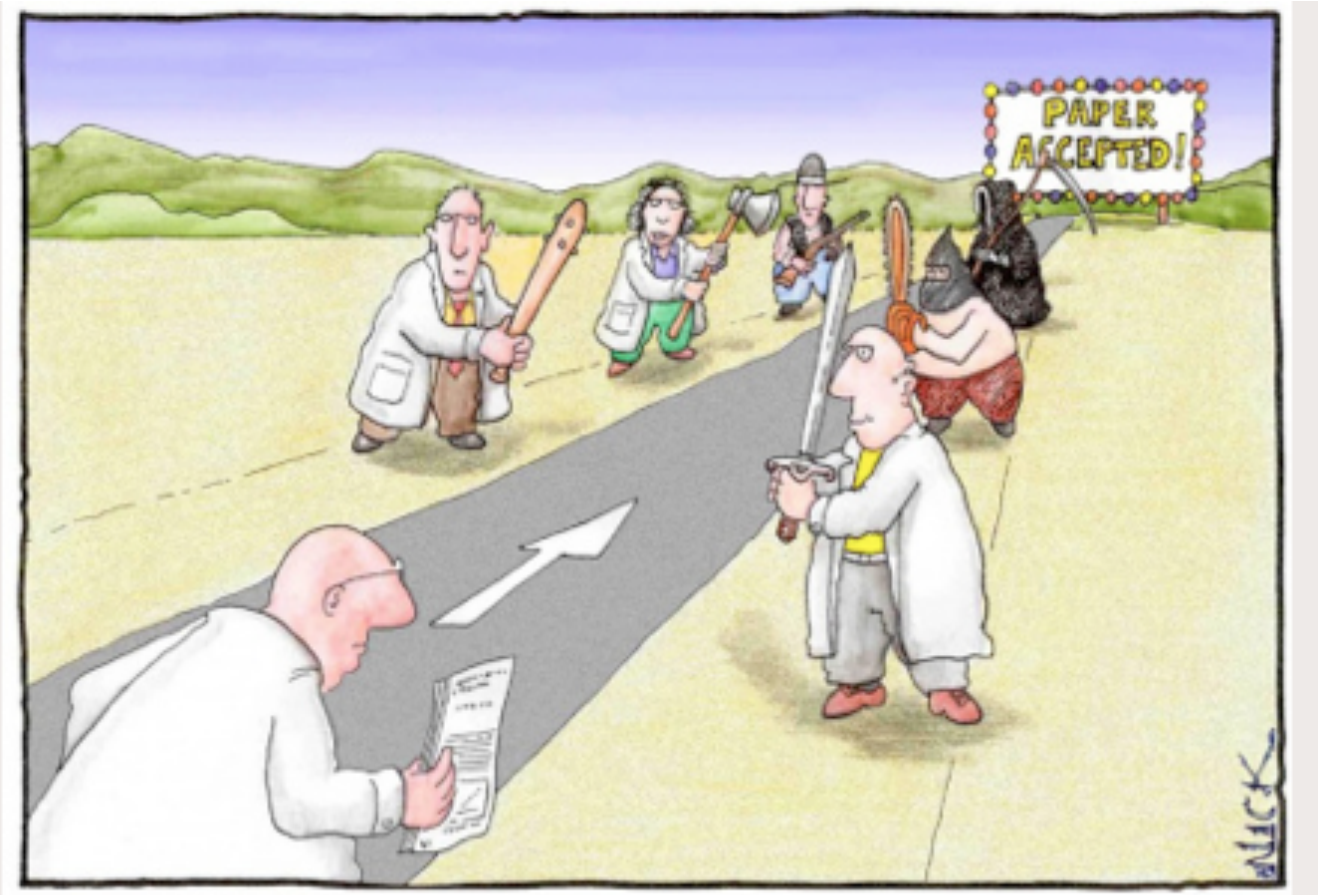
  --Where will people in your field be most likely to read your paper?

  --Is the paper's topic narrow or broad (both can be very significant)

  --Journals give some guidelines about the type of papers they are looking for

  --Think about journals you read and cite frequently

What happens after I've submitted my manuscript?



Most scientists regarded the new streamlined peer-review process as "quite an improvement."

What happens after I've submitted my manuscript?

- Editorial review first at many journals
- Editor sends paper out to reviewers (can suggest reviewers in cover letter at submission)
- Reviewers are generally anonymous; communicate with editor who communicates with you.

Outcomes

- Accept without revision—rare but joyous
- Accept pending revisions—look at reviewer comments to see if you can answer them. Don't have to do everything, but do have to address them seriously. Can talk to editor about comments.
- Reject—mourn for a little while, but then look at reviewer comments and resubmit somewhere else.

- Questions????