The Art of Scientific Writing
Goals of Scientific Writing

★ Making a clear presentation of a complex scientific problem/accomplishment
★ Addressing a specific hypothesis
★ Advocating a particular viewpoint
★ Providing a clear path for others to reproduce your work
Types of Papers

Journal
- Letter/communication
- Article
- Review

Student
- Literature review
- Proposal
Letters/Communications

★ Brief reports about important new results

★ Limited in length/number of figures/number of references

★ Format is abbreviated, and additional details often go in supporting information

★ Still must tell an entire story, even if not in great detail
Articles

★ Full reports about new results

★ Generally not limited in length/number of figures/number of references

★ May be follow-up to a letter or communication, but with complete and thorough details and additional data

★ More “traditional” format: introduction, experimental, results, discussion, conclusions
Reviews

★ Give an overview of research in a particular field

★ May be on one’s own research or on the field as a whole, depending on the journal (compare Accounts of Chemical Research and Chemical Reviews)

★ Organized differently from letters or articles as generally no primary data are included

★ Should be referenced as thoroughly as possible
Literature Review

★ Generally similar to a review paper in a journal, although often shorter

★ Should be clear and well organized

★ Clear reference to the primary literature is essential
Proposal

★ Introduces and justifies scientific work that you wish to pursue

★ Must include information to put the proposed research in perspective (mini-review)

★ Should clearly lay out path of proposed work

★ Support with preliminary results and calculations to demonstrate feasibility
★ This is a “sales” document

★ Why are the proposed experiments interesting?

★ Why should you be the person to do them? What expertise/experience will help you?

★ If successful, where might the work lead?
Common Elements

Although they are all different, the types of documents we have discussed have common elements when done well:

- Clear and precise writing
- Figures that support and help organize the text
- Logical organization
- References to the relevant literature
Our major goal in writing a scientific writing is to make a clear presentation of objective data. This means that we need to avoid ambiguity in scientific writing, so that others can understand and use our work. I find that the best way for me to write clearly is to put myself in the head of someone reading my paper who may not be overly familiar with the topic. There is a difference between clear and pedantic.
Many “readers” of your papers will look at the abstract and the figures and nothing else. It is therefore important that your figures tell a story even in the absence of the text. Figures should be clear and uncluttered, with a large enough font to be legible by older eyes. If feasible, use color to help make your figures clearer.
Clear organization is crucial to the success of your writing.

The idea is to lead the reader along a logical path to the conclusions that you want to get across.

Do not view your paper as a historical document; the order in which you did the science is not important, the order in which the science can be most logically and clearly presented is important.

While it may be useful to mention things that don’t work, only do this if it lends new insights to what does.
★ It is your ethical duty to put your work in the proper context of the science in the field

★ You must be sure to give proper attribution to any ideas or results that you use

★ Some journals limit the number of references, especially for letters; “and references therein” is a good trick here
How to Write a Paper

★ Choose or make figures that are key to your story

★ Organize the figures into the order that tells the strongest story

★ Develop an outline based on this organization

★ Write your text

★ Add references

★ Edit for clarity and completeness
The Review Process

★ Typically you are asked to suggest 3 or more qualified reviewers

★ Give names of people who are truly qualified, not just friends

★ Don’t suggest the most famous (and busiest) people in the field or the most obvious ones; it really helps an editor if you can suggest people who they may not know or have thought about
Some journals have an editorial triage process before they decide to send a paper for review. If you get triaged, you may have a chance to argue your case, but it’s often better to move on to another journal. Once your paper is sent out for review, it can take from about 2 weeks to 2 months to come back.
The Review Process

★ The editor’s decision will be based on the reviews; it could be accept (rare), minor revisions, major revisions (typically goes back to the reviewers), reject

★ This may go on for several rounds

★ When you submit a revised manuscript, you need to include a letter that lists all changes and responds to the comments of the reviewers
The Review Process

★ You don’t need to do everything that the reviewers ask, but if there is something you don’t do make sure to justify that action in your response.

★ If a reviewer is grumpy, don’t meet them head on. The editor will recognize that the reviewer is not very polite, and won’t hold this against you. If you respond by being grumpy, it might be held against you.

★ Don’t pester editorial offices unless you know that the deadline to return reviews is past. It doesn’t help anything.
The Review Process

★ The worst review you can get: “publish as is”

★ Every paper can be improved, but only if the reviewers actually read it!