Research Papers

Making them better

BEFORE WRITING

In the long term:
Right from the beginning of your project, think about experiments in terms of future papers, especially the FIGURES.

For example,
In the lab as you carry put the experiment- envisage the figure that will present the findings

It is easier to assemble all the data BEFORE writing the paper, than during the process.

Decide what are the key conclusions of the paper- the important message that you want to put across. Do you have all the data AND the figures to prove your point?

If possible, give an informal ORAL presentation of the work before you start to write the paper. This way you will clarify the story you want to tell and can anticipate objections or misunderstandings that must be addressed in the text.

Short term:
Assemble draft FIGURES and lay them out in order on a table or desk.

Decide what are the key points that you need to make, and write them out. Focus on hypotheses that you tested.

Decide on a format. This will strongly influence the style in which you write. Short format papers (e.g. Nature, Science, Current Biology, PNAS) versus Long format (papers with Abstract, Introduction, Results, Discussion).

Resolve Authorship issues. Corresponding author is usually senior author.

Have printed copies of key references at hand.

Start a Database for references e.g. ENDNOTE will format references for different journals.

SHORT FORMAT PAPER

In many ways this is the hardest kind of paper to write, even though it is the shortest. The paper has to be concise and engaging, right from the opening sentence.

For some journals the first paragraph of a short format paper ("Letter") is also the abstract and describes both the significance of the work and the major achievements.

LONG FORMAT PAPER

General considerations:
Download Instructions for Authors. Note limitations like page number, word and/or character count, number of Figures, fonts for Figures, number of references, word length of Abstract . It is best to know the limits in advance than have to go back and change the paper later.

Print out one or two examples of a high quality paper in your field in this journal.

Note specific styles (Italics/bold for headings; Hours/hrs; Fig/Figure and other special features)

STARTING OUT

Know your working style. For example, pencil and paper versus computer. Set a deadline and have a reward system!

Faced with a blank piece of paper, it is best to just put something down and edit it afterwards rather than to expect to write a perfect sentence straight away.

In general it is easiest to start writing RESULTS and MATERIALS and METHODS.
Just start writing the data as if you were describing them to your colleagues. Lay out general arguments and then go into details so that you prepare the readers for what follows and the logic you are going to use.

Next, write the INTRODUCTION, then DISCUSSION, and finally ABSTRACT. By this time you will have honed down your ideas. The TITLE is critical- it must be short and " big-picture" without over selling.

Expect to write multiple drafts, so keep track of them carefully. Word has an "Edit" program.

Don't waste paper! Print out the second draft on the back of the first.

RESULTS and METHODS

Subheadings are very useful and help keep the issues separate.

Don't include interpretation of the data (Discussion) in the Results section unless it is needed for a clean transition or to maintain the flow. E.g. "These findings suggested that…… We therefore tested this hypothesis by assaying for ……"

Arrange Figure panels so they are referred to in order.

In the Methods take special care over the units, esp. in different fonts e.g. mm versus μm (greek letters are in "Symbol" font).

Keep Methods section short; refer to earlier papers. Consider "Supplemental Material" on the Web

Acknowledgements:

Grant funding. People who read the paper or contributed to discussion and/or ideas. People who gave tools e.g. probes Technical and secretarial assistance

FIGURES and LEGENDS

For photomicrographs it is convenient to assemble panels in Adobe Illustrator or In Design.

Figures must have a short title in the form of a sentence.

Follow conventions of the journal precisely.

Don't forget scale bars!

INTRODUCTION

The first paragraph is crucial for catching the attention of the audience and for conveying to them the importance of the questions that you have addressed in the paper.

If you don't' catch the attention of the audience in the first few sentences the chances are high that they won't continue reading.

So, make the first sentence both snappy and profound.

The Introduction should set the scene for your unique contribution and place it in context. It is not meant to be an exhaustive review. Formulate the problem and the hypotheses to be tested.

The last paragraph of the Intriduction should be a short summary of what you set out to do and what you have achieved.

e.g
"In this paper, we have studied the …… by using a novel technique in which ……. This approach has allowed us to directly compare A and B, and to distinguish between alternative possibilities for their functions. We conclude that ….. and provide a model to reconcile our findings and those of others"

DISCUSSION

Do not make this predominantly a rehash of either the Introduction or the Results. It should present the overall significance of your work and show how it agrees or disagrees with previous models or allows disparate observations to be drawn together. It is often very helpful to have a Figure of new model that is based on your findings.

First paragraph of the Discussion should give a brief overview of the main findings of the paper: the final conclusions and an outline of the supporting data.

Final paragraph can make predictions for the future and can be made in broad brush strokes. But don't speculate too wildly.

GENERAL STYLE

Use "Spelling and Grammar" option in Microsoft Word. However, remember that Spellcheck will only highlight words that do not correspond to an entry in the dictionary.

For example if you typed
"We added halt and than heater fur too ours to denature the protean.
rather than
"We added salt and then heated for two hours to denature the protein"

Spellcheck will not find any mistakes!

TENSES

Text can be written in either the past or present tense, and the preference is to some extent personal. Past tense is OK for describing results of an experiment but use present tense for a general conclusion.

WHATEVER TENSE IS USED, BE CONSISTENT AND DON'T SWITCH BACK AND FORTH IN THE SAME PARAGRAPH !!!

Keep sentences short. 15-20 words is about right but shorter ones can be used for impact or emphasis. Check that each sentence makes sense and is not ambiguous.

A. An example of a sentence that is too long:

"Genes A, B, C and D and their antagonists are expressed at high levels in the thymus of the wild type embryos but in the heterozygous mutants they are lower and in the null mutant they are absent except in a small region where the latter are expressed at low levels"

B. This is better:

"Genes A, B, C and D, and their antagonists, are expressed at high levels in the thymus of wild type embryos. Transcription of all genes is lower in heterozygous mutants. By contrast, in homozygous null mutants no expression of any gene could be detected, except in a small region in which the genes encoding the antagonists are still fully active."

At all costs, avoid the passive voice.

"Oocytes are signaled by MSP such that a cell cycle transition (M-phase entry) occurs" (not good)
versus
" MSP signaling induces oocytes to enter M-phase of the cell cycle". (good)

"The genes were seen to be expressed…. (not good)
versus
"The genes were expressed…." (good)

Paragraphs are important to break the text up into readable units. They should be about half a double-spaced, typewritten page in length.

Avoid excessive use of boring verbs such as "show, observe, occur, exhibit….."

Avoid complex ways of saying a simple thing
" The results showed protection by the vaccine" versus "The vaccine protected"

"The results showed that dog weight increased" versus "The dogs weighed more".

Use of "suggest that …." ; "hypothesize that…." "possible that…."
These phrases do not need "may", "might"

e.g "Our results suggest that Hoxa3 may be involved in thymus development" (not correct)

"Our results suggest that Hoxa3 is involved in thymus development" (correct)

"It is possible that Shh in the endoderm may regulate Bmp4 expression in the mesoderm".(not correct)

"It is possible that Shh in the endoderm regulates Bmp4 expression in the mesoderm". (correct)

BEFORE GIVING THE DRAFT TO YOUR P.I.

Check the Figures versus the text
Check the References versus the text
Check the Figure legends

In general, edit a paper after printing it out and reading it as a whole, rather than editing it on a computer screen where you can only see one page at a time. Once a page has scrolled off the screen the text tends to be forgotten!

Be psychologically prepared to throw out and rewrite whole sections and not to cling to the original.

Be flexible.

BEFORE SENDING TO THE JOURNAL

Have the paper read by several people. Listen to what they say, especially if same criticism comes up several times. Check and recheck spelling, figures, references, legends etc Reviewers can be really annoyed by careless editing and mistakes reflect badly on your science.

Make sure you have followed all the requirements of the journal about electronic submission etc Some have a specific Checklist and Front Page format (key words; contact Information; e-mail address etc

Include a cover letter outlining the originality and important findings of the paper and why it will be of interest to the typical audience of the journal you have selected.

Sometimes it is helpful to suggest possible referees, especially if the topic is unusual.

It can save time to send a "presubmission enquiry" to the editor. This should outline in the most persuasive way the importance of your paper. Then the editor can reply with either encouragement to send the complete paper for review or a polite suggestion that you send it to another journal.