Advice on writing scientific papers in the Judelson lab

Writing papers on your data are an important part of your training. Here are some suggestions to stream-line the process. This is not meant to be a comprehensive description of how to write a scientific paper, just highlights of some common problems and issues that apply to most (not all) papers and journal styles.

Scientific writing is a skill that must be honed and this only occurs through experience and thoughtful review of one's writing and the writing of others.

Getting Started

1. Assemble all of your data.
2. Decide on a rough outline of how the paper will be presented. Discussing this with Howard (me) is encouraged. Although everyone may like to write in their own particular style, and maybe even some of you write better than I do, I am the final arbiter of the paper: coordinating your efforts with me will facilitate the writing process.
3. Pick a journal for your paper. It is helpful to do this at an early stage, to ensure that the text and figures are in the proper format.

Figures and Tables

4. I like to start by preparing the figures and tables, ideally in the final form. This helps me be sure of what the data is. Also, by making a "final" version of the figure or table, this will help ensure that they will agree with the text. Whenever possible, use a figure instead of a table: relationships between numbers are more readily grasped when presented graphically.
5. Check the requirements of the journal for the figures. Most journals require a san serif font (Helvetica or Arial), and have particular specifications. Generally, we start making figures in Adobe Photoshop, and then export them in tiff format for the journal. Check the resolutions required for the figures; typically photos (continuous tone) are 300-600 dpi minimum, while line drawings are 600-1200 dpi. You can't raise the resolution after the figure is finished! Powerpoint is generally unacceptable, since it reduces the resolution of figures.
6. Plan the layout of each figure. Will it be one column wide, or two? One panel, or multiple panels? Look at figures in journals (and our lab) to see what works well. Think about how the figure will look once it is published.
7. Try to use informative labels on figures. For example, labelling lanes with a meaningful one or two-letter code is better than lanes with numbers 1-10, etc. The easier the figure is to interpret, the more likely that the paper will be like by the reviewer!
8. Don't be sloppy. Make sure that elements of your figures are properly aligned, letter sizing is consistent, etc. A sloppy figure means a sloppy scientist, which means your paper may get rejected by the journal!

9. Don't overmanipulate the contrast or brightness of blots, etc. Usually using the "autolevel" feature of Photoshop or equivalent programs is sufficient. No matter what you do, treat all parts of an blot the same!

Writing the Text

10. I expect that you will provide me with a COMPLETE draft of a paper. I am happy to discuss papers at any stage in the process, but eventually you will need to provide me with a finished manuscript in the format required by the journal. If English is not your native language (and even if it is), I expect to make a lot of corrections. However, do not waste my time by handing me something that you know is incomplete or did not put much effort into.
11. Related to the above is: don't be sloppy or lazy! Italicize the proper parts of restriction enzymes, species, etc. Indent paragraphs using a tab (as in nearly all journals). Place two spaces after periods. Avoid contractions, (did not vs. didn't). Provide page numbers in the header or footer. Use correct sentence structure and punctuation. Add all literature citations (don't make me look for them!). if you mention a manufacturer of a special product, provide the city, state, and country of its location. Try not to use abbreviations such as i.e., or numbered lists (as in the second paragraph of the next point; this is generally lazy writing.
12. Sometimes it is helpful to start by writing out a conclusion first. Have a single, key point you are trying to make. If you write this first, then you can write the rest of the paper to just make this point.

    Once you know the conclusion, then you can think about the introduction, which should (i) establish that the general topic related to the conclusion is interesting and important; (ii) say what is already known—concisely! (iii) point out that there is one key thing that is still unknown, without which science can not progress. (iv) end with a description of what this paper is about!
13. The flow of the manuscript should be an inverted triangle. The paper should work from the general question to the specific question. One exception is Discussion: think of an upright triangle, and begin with the specifics of your findings and then move to a broader discussion of your results and their significance.
14. A scientific paper is not a mystery story. Do not hold the reader in suspense. Make it easy for him/her to understand. At every stage, the reader should know where he/she is in the story, where the story is going, and what the meaning of the data are. To do this:

    - If allowed by the journal, break Results into sections, each with an informative title.
    - As much as possible, the first sentence of each paragraph should give the conclusion, or at least an introduction, of what is to follow. Remember, not all reviewers will carefully read your paper; they may lose attention after the first sentence!
    - As much as possible, all sentences should flow naturally into each other.
    - As much as possible, all paragraphs should flow naturally into each other. Become a master of transitions.

15. A paper is not a lab notebook. Not all data, and not all details of the methods, need to be presented. Also, while lab notebooks are in chronological order, a paper forms a story from the data. Put things in the most logical and easy-to-follow order.
16. Avoid use of the first person (I, we). However, there are places where this is acceptable; often the last paragraph of introduction says "In this study, we show---).
17. Help the reader understand the experiments and the conclusions. Don't do "data-dumping"—this is where the author just says "hey, I am too busy to summarize the information for you. Just go look in the table and figure this out for yourself."
18. The more concise a paper, the better. Write with precision, clarity and economy. Every sentence should convey the truth as simply as possible, while avoiding jargon.
19. Along the same lines of being consise, in Introduction or Discussion, do not get lost in reviewing background information. Remember that the function of an Introduction is to present the question being asked and place it in the context of what is known about the topic, not summarize and evaluate all literature. You are not writing a review! Similarly, avoid too much speculation in Discussion.
20. Along the same lines, in Materials/Methods, while experiments should be described so that others can repeat your work, you do not have to completely describe procedures shown elsewhere (you can cite a paper from our lab). Provide enough so that the reviewer can follow the general idea of the procedurem, and don't waste space describing standard methods like how to do a miniscreen or blot (although some details like what "high-stringency hybridization" means would help.
21. Along the same lines, avoid repeating information in Materials/Methods, Results, and Figure Legends. Sometimes a procedure is best described in Figure Legends.
22. Minimize the use of parentheses and semicolons. They are OK if used sparingly, but overuse impairs the flow of the text.
23. Use the proper tense: Experimental procedures and results are narrated in the past tense (what you did, what you found, etc.) whereas conclusions are given in the present tense.
24. Avoid excessive discussion in Results. A brief sentence of interpretative discussion or background is OK, like the rationale for performing an experiment.
25. Don't bore me or the reviewers of the paper, especially in the Discussion.
26. "Data" is plural. "The data were", not "the data was."
27. Never start a sentence with a number, rather reword it so that you may write the number out, or write out the number in words. Whole numbers from zero to ten should be written as words, higher numbers (123 or 5.4) can be left as numerals. As appropriate, be consistent with your use of significant figures (0.99 vs. 0.99934).
28. Avoid excessive adjectival nouns, for example: "encysted mononucleate six-hour *P. infestans* zoospore cysts."
29. Avoid the word "significant" unless you have a *P* value to back it up.
30. Statements of results must be supported by data!
30. PROOFREAD!