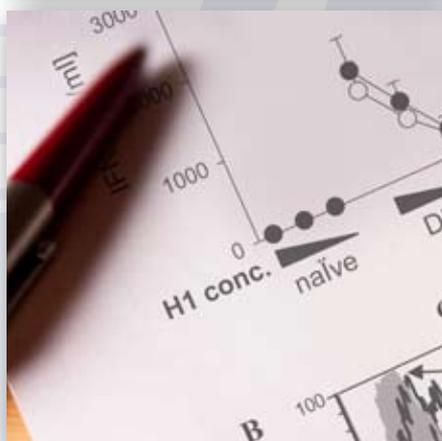
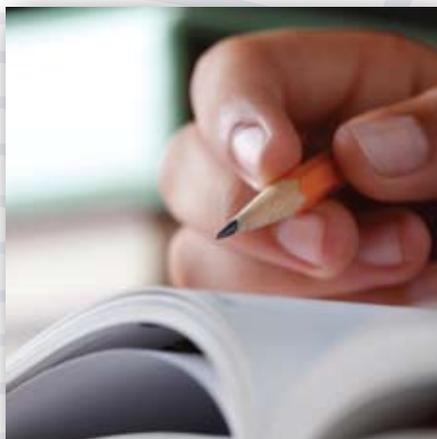


Scientific Publishing



Dos and Don'ts for Authors and Reviewers

*Collected articles based upon presentations given
at a special session of the AAI Publications Committee
at IMMUNOLOGY 2009™ in Seattle, Washington*

May 10, 2009

Reprinted from the AAI Newsletter, November 2009–May 2010



Scientific Publishing

Dos and Don'ts for Authors and Reviewers

There's a science to writing and reviewing that's essential to every investigator's career success. AAI offers this collection of articles to help demystify the publishing process and provide something of a methodology for writing and reviewing scientific manuscripts.

The four articles included here are based upon presentations made during the May, 2009, AAI Publications Committee-sponsored symposium* at the 96th AAI Annual Meeting in Seattle, Washington. The articles appeared serially in the *AAI Newsletter* during the subsequent year, prompting a number of requests for reprints. As a service to its members and other immunologists, AAI has republished the articles together as a convenient reference resource.

AAI is grateful to the presenters and the AAI Publications Committee for providing this important career development resource for investigators at every career stage.

* *Scientific Publishing: Dos and Don'ts for Authors and Reviewers*

Table of Contents



Dos and Don'ts for Writing a Scientific Manuscript

Pamela J. Fink, Ph.D., Professor, University of Washington and former Deputy Editor for *The Journal of Immunology* Page 1
(From the *AAI Newsletter*, February 2010)



The Appropriate Use of Statistics in the Biological Sciences

Pamela A. Shaw, Ph.D., Mathematical Statistician for the Biostatistics Research Branch, National Institute of Allergy and Infectious Diseases, NIH Page 5
(From the *AAI Newsletter Special Issue*, March 2010)



The Ethics of Scientific Publishing

Jeremy M. Boss, Ph.D., Chair, Department of Microbiology and Immunology, Emory University School of Medicine and Editor in Chief for *The Journal of Immunology* Page 8
(From the *AAI Newsletter*, May 2010)



How to Be a Valued Reviewer

JoAnne L. Flynn, Ph.D., Professor, Department of Microbiology and Molecular Genetics, University of Pittsburgh School of Medicine Page 11
(From the *AAI Newsletter*, November 2009)



The American Association of Immunologists
9650 Rockville Pike, Bethesda, MD 20814 -3994
Tel: 301-634-7178 • Fax: 301-634-7887
Email: infoaai@aai.org

Scientific Publishing **Dos** and **Don'ts** for Authors and Reviewers

Dos and Don'ts for Writing a Scientific Manuscript

From the February 2010 issue of the AAI Newsletter.

Based upon a presentation by Pamela J. Fink, Professor, Department of Immunology, University of Washington. Dr. Fink is a former Deputy Editor for The Journal of Immunology and current member of the AAI Publications Committee.



Pamela Fink

The task of writing a scientific paper can be quite daunting whether it's your first or your 50th. Learning some basic "rules of the road," however, can demystify the process and provide you with discrete steps in a manageable progression. The following are some dos and don'ts for preparing a scientific manuscript.

Step One: **Decide Where to Submit**

Don't: Start your paper without a clear plan for where you will submit it.

Do: Decide early in the process where you will submit your work, matching the depth and focus of your studies with those of the chosen journal. Failure to select the journal with the "best fit" can prevent the timely publication of your data and lead to much unenjoyable reformatting of your manuscript.

Consider whether your findings are of broad scientific interest or are very specialized. Is your paper describing a breakthrough finding or a more incremental advance? Research the scope of prospective journals. Such information is generally provided on journal websites. (For *The JI*, visit www.jimmunol.org/misc/infoforauthor.dtl).

Once you have decided on a journal, follow its instructions carefully for how to format your manuscript for submission. (For *The JI*, visit www.jimmunol.org/misc/authorinstructions.dtl)

Step Two: **Put Your Figures into Final Form**

Don't: Lose sight of your data.

Do: Start by finalizing your figures. All sections of your paper will relate directly to your figures, so putting your figures in final form is the essential first step. (See Chart 1, below) Pay particular attention to the proper use of color, the size of figures, the preferred fonts, and correct positioning of labels and text. Be sure to use an illustration program that is compatible with the journal's format requirements.

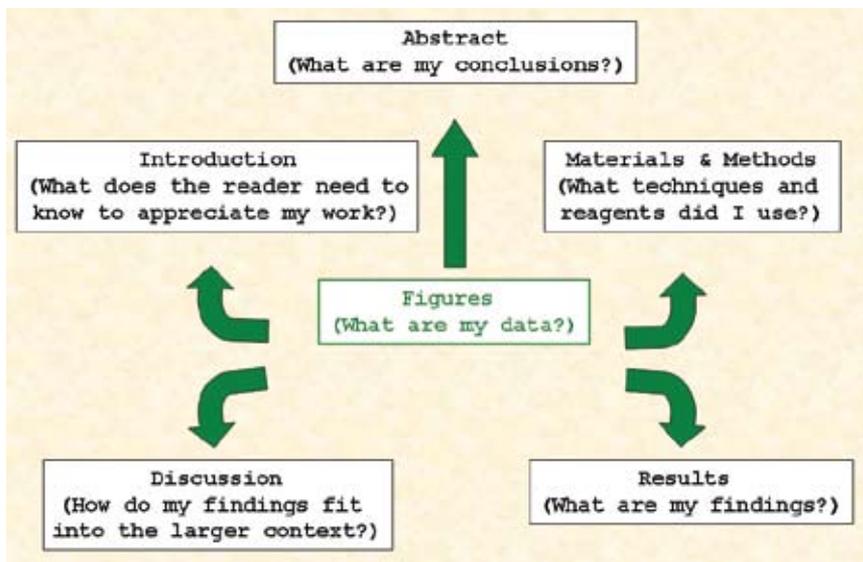
Don't: Make your reader suffer through all of your frustrations and false starts.

Do: Focus on your findings, not your missteps and setbacks. Chronological order may not be your best bet. Arrange your figures to tell the "story" logically.

Don't: Design composite figures with generic titles.

Do: Design each figure to make one clear point and state the point as the title of the figure. For example, in Figure 1A, the figure title is uninformative and the two graphs are unrelated. In Figure 1B, the line graph has been removed and the figure title now concisely states the findings presented by the scatter plot.

Chart 1—Figures Are Your Foundation



Don't: Make your reader work hard to follow the flow of data in your figures.

Do: Arrange figure panels so the eye naturally follows the appropriate order. In Figure 2A, the order of the panels is illogical. Reorganized, as in Figure 2B, the panels tell the story logically. Arranging the figure panels to generate a symmetrical square or rectangle also eases interpretation. (Compare Figures 3A and 3B on page 3). Keep in mind that figure panels will be sized proportionately for publication. If a larger panel is paired with a much smaller panel, data in the smaller panel may be too small to interpret.

Don't: Cut corners when submitting your figures.

Do: Submit high-resolution figures. If figures are blurry, reviewers may interpret that fact as a sign of haste and sloppiness on your part in the lab as well as at the computer.

Step Three: Write Legends, Materials and Methods

Don't: Wait to write these sections until after writing the article.

Do: Write your figure legends and materials and methods section while you have your figures clearly in mind.

In each figure legend, briefly describe your data in the order it is presented in the figure. Legends should make figures understandable in isolation, but they should not be fully repetitive of the material and methods section. The methods section, on the other hand, should be comprehensive and provide enough detail to allow the reader to repeat the experiments you are reporting.

Step Four: Write Your Abstract and Title

Don't: Lose the focus you have achieved in finalizing your figures.

Do: Write the abstract before you write the results section.

Distilling your findings

Design Figures to Make Your Point Clear

DON'T

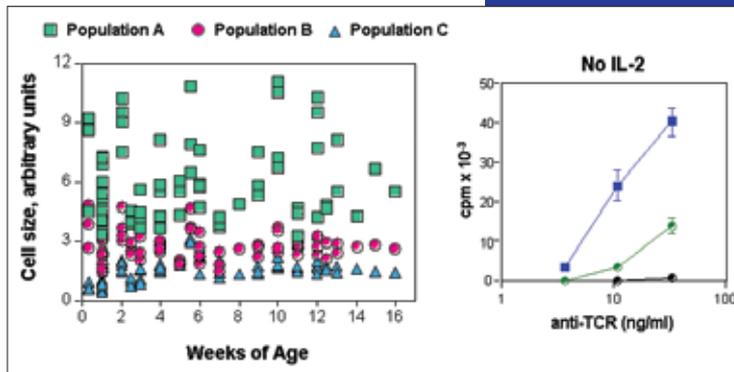


Figure 1A: Sizes of 3 cell populations and cell proliferation after TCR stimulation.

to their essence at the outset will help keep you on track as you write the rest of your paper. Work with, not against, the abstract word limit set by the journal. If your abstract is too long, you are probably including too many subsidiary points!

Once your abstract is finalized, focus on the title. The title is what will or won't draw in your readers. It will be used to index your article, so inaccuracy can reduce its recall in your field. The title should be a concise label, not a descriptive sentence, and it should capture the main points of your manuscript. For example, suppose that your study identified a novel gene that modulates the activation threshold of memory T cells. The title

DO

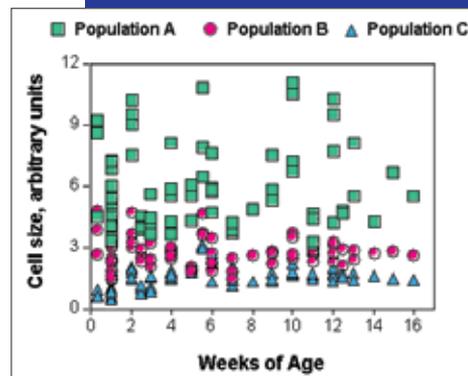


Figure 1B: Population A cells are larger than those of population B and C.

“Studies on threshold modulation of memory T cell activation” accurately describes your study but is too general to be informative. Instead, “Novel gene x modulates the activation threshold of memory T cells” is more informative. If gene x is expressed in only a subset of T cells, namely CD4+ T

Organize Your Data Panels Logically

DON'T

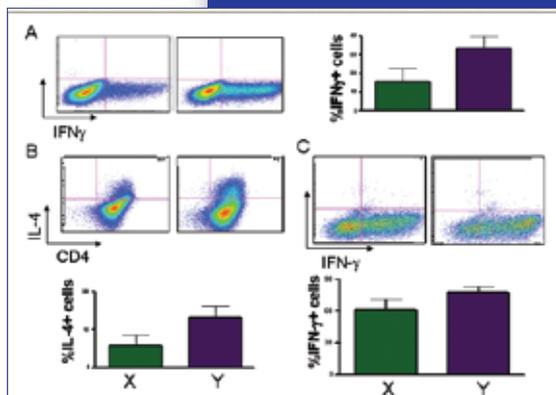


Figure 2A

DO

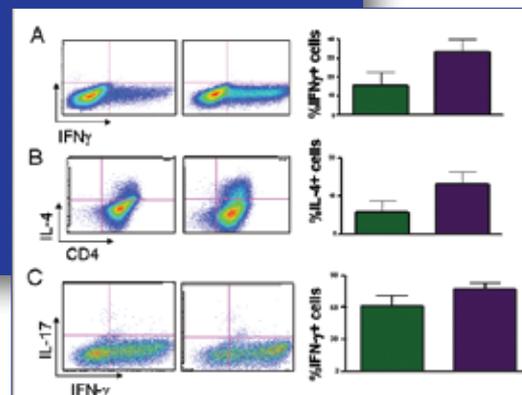


Figure 2B

cells, consider this title: “Novel gene x modulates the activation threshold of memory CD4+ T cells.” If you cloned gene x from chickens and there are no homologues in other animal species, or you simply do not know, define the species “...activation threshold of chicken memory CD4+ T cells.” If novel gene x is a member of a previously defined gene family, include that information as well: “Novel alphabet family member gene x modulates....” Pay attention to syntax. In the title, “The threshold of the memory T cell was studied and a novel gene x was determined to control its modulation,” “its” may refer to gene x or memory T cell. The title is the lead into your manuscript, so be sure to spend plenty of time getting it right.

Step Five: State Your Results

Don't: Repeat the materials and methods section here or assume

that this is the place to explain the significance of your findings.

Do: Briefly describe your data in the order in which it is presented in the figures. If possible, divide the results into subsections with subheadings very similar to your figure titles. Including a one-sentence conclusion at the end of each subsection is a huge help to readers. For example, “These data indicate that gene x constitutively associates with the T cell receptor complex.” You can also use the final sentence to explain your rationale for the scientific question addressed in the next section. For example, “Our observation that decreased levels of gene x expression correlated with decreased frequencies of memory T cell activation led us to investigate whether the expression levels of gene x modulated the activation threshold of memory T cells.”

Step Six: Write the Discussion

Don't: Repeat the results section or emphasize results that may be perceived as incidental findings.

Do: Place your research findings in the greater scientific context. Discuss how they advance the field and offer explanations for any data that contradict published work. The discussion should be a scholarly piece of writing. It is your opportunity to place a personal stamp on your paper. Expect to write many drafts to get it right!

Step Seven: Write the Introduction, Cite References

Don't: Fail to emphasize the relevance of your research.

Do: Define the unanswered questions that determine the focus of this research.

Use the introduction and supporting references to show the reader which work you place at the center of your field. Begin by describing the current state of the scientific field that you are investigating. Cite key original scientific reports, not just reviews.

To introduce your study regarding the threshold of memory T cell activation, you might start by reviewing key discoveries that have led to present-day understandings of T cell activation. Discuss what is known about threshold determination. Narrow your introduction to a review of the known differences between naïve and memory T cell activation. You may need to discuss models and competing theories. Be sure to establish why the questions your study answers are significant. The final paragraph can offer a brief summary of your findings.

Don't: Be careless in providing author information, assigning proper credit, or identifying potential conflicts of interest.

Do: Take time to ensure that everyone mentioned in your article, the coauthors and other contributors, are properly identified. On the title page, the names of coauthors should be written as they prefer (e.g., with

Panel Arrangement Facilitates Interpretation

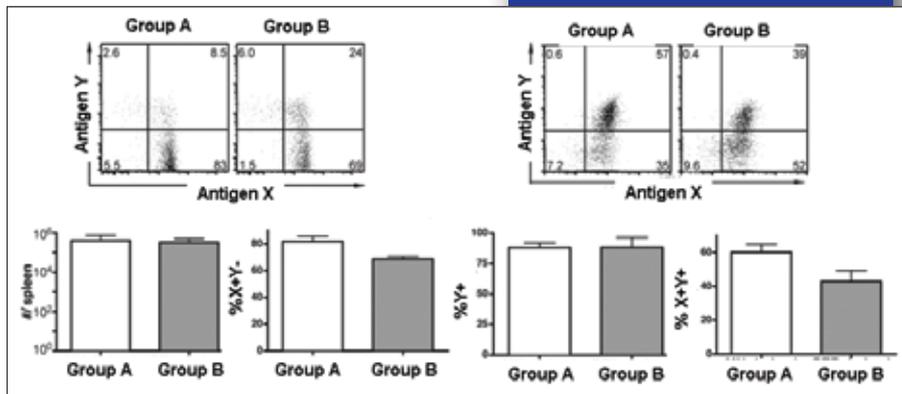
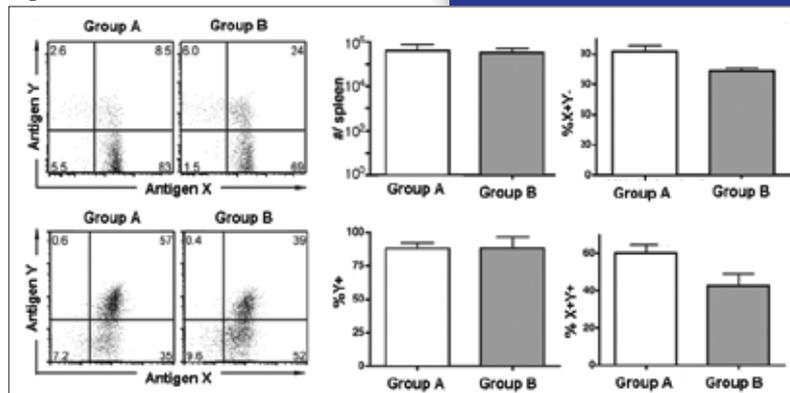


Figure 3A

Figure 3B



middle initial(s) and/or formal first name) and their institutional information, properly stated. Be sure that all coauthors are in agreement on the inclusion and order of the names. In the acknowledgements section, recognize those who gave technical assistance, supplied reagents, offered helpful comments and/or suggestions. Some journals designate the acknowledgements section for presentation of information such as grant support or the disclosure of potential conflicts of interest, such as commercial affiliations, consultancies, or stock holdings. Be sure to check the journal's instructions regarding these matters.

Step Eight: Compose the Cover Letter

Don't: Treat the cover letter as a formality of superficial importance.

Do: Spend time crafting the cover letter. This is an opportunity for you to address the editor(s) and reviewers directly—to explain to them on a more personal level why you believe your work is of great importance and merits publication in their journal.

By convention, the cover letter is addressed to the journal's editor in chief. Explain why you believe your manuscript is appropriate for this journal and highlight the article's main points. This information can also help the journal staff direct the manuscript to the most appropriate editor(s) and reviewers.

Don't: Simply reuse previous cover letters.

Do: Edit recycled cover letters, as necessary. If this manuscript was previously rejected by another journal, make sure the cover letter has been appropriately edited to eliminate any references to the previous journal. Be sure to modify statements about your research, if necessary, to fit the scope of the new journal.

Step Nine: Submit the Manuscript

Don't: Submit without outside input.

Do: Once you have a solid draft, solicit comments from colleagues and then revise and edit accordingly.

Don't: Submit without obtaining necessary consents.

Do: Provide a copy to all coauthors and obtain their consent to publish. Most research institutions and private companies also require in-house approval before a manuscript can be submitted, so be sure to follow your particular organization's publication rules.

Don't: Forget to broach copyright issues.

Do: Include a statement asserting that the manuscript is not currently under review or submitted to another journal. Indicate that the manuscript has been approved for publication by all authors and state that there has been no previous publication (unless in a meeting abstract) of the material within the manuscript.

Plan for Writing Your Paper:

- **Decide Where to Submit**
- **Put Your Figures into Final Form**
- **Write Legends, Materials & Methods**
- **Write the Abstract and Title**
- **Write the Results Section**
- **Write the Discussion**
- **Write the Introduction, Cite the References**
- **Write the Cover Letter**
- **Submit Your Paper**
- **Respond to Reviewers' Comments**

Once all of these steps have been completed, review the targeted journal's policies and procedures. Following the journal's instructions, upload your cover letter, manuscript, and figures and SUBMIT!

Step Ten: Respond to Reviewers

Once the article has been reviewed,

Don't: Look for bias and intent to cause pain. While conspiracies probably do exist, you are not likely in the midst of one!

Do: Begin with the presumption that the reviewer was unbiased and put substantial (unpaid) effort into understanding your work. This is, after all, the most likely scenario. Besides, assuming otherwise is simply not productive. If the reviewer misunderstood some of your data or experimental design, do not focus on assigning blame for the misunderstanding but, rather, on what you can do to prevent other readers from experiencing a similar fate. If a comment sounds snide to you, ignore the reviewer's tone and focus instead on the point being made. Don't expend any effort trying to identify your anonymous reviewers. There really is no productive point to this exercise, and in my experience as an editor, authors are rarely correct in their assumptions.

Don't: Respond to these comments hastily, even to your coauthors. Do not inflame potentially raw feelings.

Do: Draft a measured reply to the critique; make a list of changes to be made and additional experiments to be performed. Wait a day before revisiting your rebuttal letter and discussing the plan with each coauthor. In my experience, revised manuscripts ARE better than the originals. The process, while painful, does work!

Scientific Publishing **Dos** and **Don'ts** for Authors and Reviewers

The Appropriate Use of Statistics in the Biological Sciences

From the March 2010 issue of the AAI Newsletter.

Based upon a presentation by Pamela A. Shaw, Mathematical Statistician for the Biostatistics Research Branch, National Institute of Allergy and Infectious Diseases, NIH.



Pamela Shaw

Mathematical confirmation of research findings is an essential component of science. While biological researchers often find the application of statistics to their results a daunting task, there are steps researchers can follow to help ensure that their data are properly analyzed and presented in their publications.

Careful Planning and Design

Researchers can sometimes find themselves unable to make sense of their results because of unexpected factors arising during their study. When such frustrated researchers come to me looking for post-study help with their statistical analysis, I often find myself playing the role of a confessor, asking “What was your *a priori* hypothesis? How did you plan to test it? What actually happened?” Occasionally, by going back over what was planned and how it was executed, researchers can fit an appropriate statistical model to their data. Too often, however, a flawed design cannot be salvaged.

How can you avoid such an unpleasant scenario? Meet with a statistician early on and include a statistical analysis plan in your study design. Employing a statistician early is somewhat like taking out an insurance policy. Biostatisticians can help you design your experiments in such a way that unexpected variables or events are less likely to sabotage your study. A statistician can help you determine

the number of measurements necessary for the level of evidence desired and determine the right experimental design for desired comparisons. The statistician can also help you think about possible sources of variation, such as learning effect, varying background, batch effect, edge effects, and the need for randomization. Finally, knowing up front the statistical model you will employ enables you to determine the proper controls. So, in another sense, meeting with a statistician before you embark on data collection is like practicing preventive medicine.

Avoiding Common Pitfalls

Proper randomization can maintain balance of several factors simultaneously, including unexpected ones such as changes in reagent lots or technicians mid-experiment. Randomization can be a very powerful tool, but ask yourself, “Am I really randomizing?” For example, taking mice from a cage in an apparent random fashion to deliver an experimental or control treatment might not result in a randomized sample. If you give the first half of the mice pulled out of the cage one treatment, you may have inadvertently introduced a difference between treatment arms, as more docile or less vigorous, less healthy mice will likely be taken first. Also consider sample size. A sample size should be large enough not only to detect the desired effect reliably,

given the underlying variability in the population, but also to absorb the possibility of outliers and unexpected losses of study samples or subjects. The number of measurements that are required will depend on the level of evidence desired (e.g., $p < 0.05$), the size difference that you are interested in detecting, and the desired power to detect that difference (i.e., the probability that the test will reject the null hypothesis given the alternative is true). Meeting with a biostatistician before you start collecting data can help ensure that your experiment has adequate power and a design that is robust enough to withstand unexpected sources of variability.

Choosing the Right Statistical Method

Generally, we use statistics to test a “null hypothesis,” that is, the assumption that there is no difference between what we are comparing. For example: *The infection rate is the same for vaccine and placebo group.* Your statistical test will determine the strength of evidence present in the data to reject the null.

Selection of the appropriate test will depend upon whether your

data are continuous, categorical, or dichotomous. If you are willing to make assumptions about the distribution of your data, such as whether they follow the normal distribution, you can choose a parametric test like the t-test. Otherwise, a nonparametric test like the Wilcoxon may be a better option. The proper test is also determined by sample size. With small sample sizes, exact tests may be the only option for proper inference, for many of the usual tests (chi-squared or t-test) rely on large samples or strong assumptions about the distribution of data to be valid. Finally, consider whether there is correlation in your data. Correlation, or the degree to which two or more attributes or measurements show a tendency to vary together, can come in many forms. Multiple measures on the same individual, litter effect, plate effect, batch effect, and experiment day are factors that can induce correlation, to name a few. Calculations ignoring correlation or clustering can result in the wrong conclusions.

Drawing the Right Conclusion

Much confusion for scientists surrounds the question of whether to use standard deviation (SD) or standard error (SE) when reporting results. SD is a measure of the data spread or the variability in a population; SE is a measure of the uncertainty in your statistic, or of, say, how precise your measure of the mean is. Report the one of these two quantities that is of greater scientific interest, given your type of experimental data.

Another occasionally problematic aspect of statistics for scientists is the interpretation of the “p-value.” The p-value is the probability of observing, just by chance, results at least as extreme as those in your data, given the null hypothesis is true. If you have a small p-value, chances are low. For example, if you get a

p-value= 0.03, there is only a 3 percent chance of seeing data this extreme or more extreme simply by chance. By convention, p-values of less than 0.05 are considered strong evidence against the null and the result is declared statistically significant. Note, though, that “not significant” is not the same as “not different.” You cannot claim to have proven there was no difference unless the study was designed to test for equivalence. The lack of statistical evidence for a difference may be due to a true difference being much smaller than the study was designed to detect or it may simply be due to bad luck.

It is useful to provide confidence intervals (CI) in addition to p-values for your principle statistics of interest. The CI is an interval of plausible values for the parameter of interest. The usual 95 percent confidence interval for the mean is the mean \pm 1.96 SE. Confidence intervals provide more information than p-values provide. They provide an estimate of both the magnitude of the effect and the uncertainty in your estimate. Statistical significance is not the same as scientific significance! With lots of data, small (biologically unimportant) differences can be statistically significant. A p-value provides information only on statistical significance, whereas a confidence interval can be used to judge both significance and scientific relevance.

Reporting Your Results

Within your manuscript, all graphs and tables should be self-explanatory. Graphics should reflect your design and be informative. Key summary statistics can be useful to display on the graph and should be clearly noted in the legend. For example, in the figure legend, be sure to explain whether error bars denote SD or SE, give p-values, and/or CI when appropriate. Any omitted data points should be noted.

The way you display your data is extremely important. The wrong type

of display can be misleading and can obfuscate your results. When you have binary data (yes/no, dead/alive, success/failure, positive/negative), a 2x2 contingency table can be useful for both paired and unpaired data. For continuous data, if the data are unpaired, Figure 1 is an appropriate graph, while the upper graph in Figure 2 is a more appropriate graph for paired data. As Figure 2 illustrates, the significance level can be very different for paired and unpaired data. Therefore, it is important to graphically represent the correlation in the plot. When presenting a plot of data with many data points, a box plot with bars to indicate the summary statistics, such as median, inter-quartile range (IQR), and range, can be a more useful representation of your data. If there are not enough points (fewer than 10-15 points), box plots may be misleading, as they emphasize summary statistics, such as the IQR or minimum/maximum. These values will generally be very poorly estimated with only a few data points. Take care to match your data with the correct data display so that your results are easily interpretable and clearly substantiate your claims.

Summarizing Your Methods

In the materials and methods section of the manuscript, be sure to describe how you collected your data and the statistical methods of analysis used. If a non-standard statistical method is used, it should be fully explained or adequate reference provided. If there is a fair amount of data processing, such as normalizing the data or excluding data points, this should also be explained. In the methods section, be sure to

- Describe the key attributes of the population/material studied, such as the
 - Size, demographics
 - Nature of the control group (matched? historical?).

- Describe the key aspects of your experimental design, such as whether
 - Multiple treatments are employed. If so, describe your method for assigning different treatments (randomized? blocked?)
 - Experiments were done on different days
 - Assays were analyzed in batches
 - Fresh versus stored samples were used.
- Describe the type of quality-control assessments that you used

If your data analysis has involved several statistical tests, your section should describe each of the tests that you performed.

Excluding Data from Results

Avoid throwing out data points. Any data exclusions should be reported in the manuscript and be subject to peer review. Realize that the decision to exclude data is often influenced by expectations of what the result should be. Know, too, that excluding data introduces the risk of destroying randomization, and that omitted data can arouse suspicion about the integrity of your data. It is best to

- Keep outliers in the analysis and choose statistics less influenced by outliers (e.g., rank methods). This is generally preferable to throwing out data.
- Have a robust design.
- Report excluded data. If some data are excluded, calculate and report results with and without exclusions for comparison. (For example, present both the intent-to-treat and per-protocol analyses.)
- Describe your reasons for exclusion of any data.

Summary

Involve a statistician in the planning stages of your study to ensure that you can make sense of your results. At the completion of your experiments, consult again with a statistician to select the correct statistical method(s) for analyzing your data. In your manuscript, be sure to describe how you acquired your data and report the methods of statistical analyses employed. For the presentation of your results, choose data displays that properly represent your data and include supporting statistics. Finally, when you are set to submit your completed manuscript, consider seeking a statistical review of your interpretation of the data. Presenting a sound statistical summary of your findings will best communicate the scientific importance of your work.

Figure 1—Data are shown by group. The group means and error bars (± 1 SD) are denoted by horizontal lines.

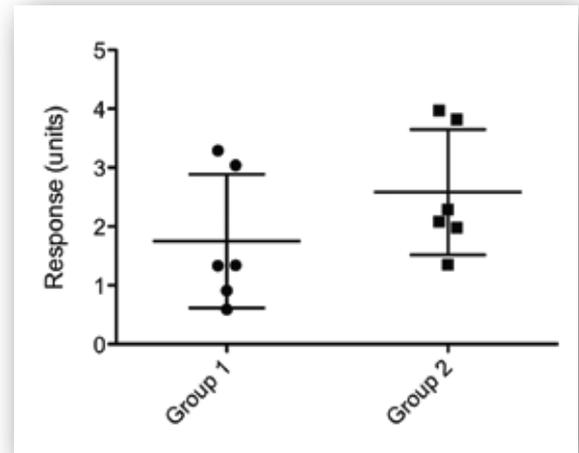
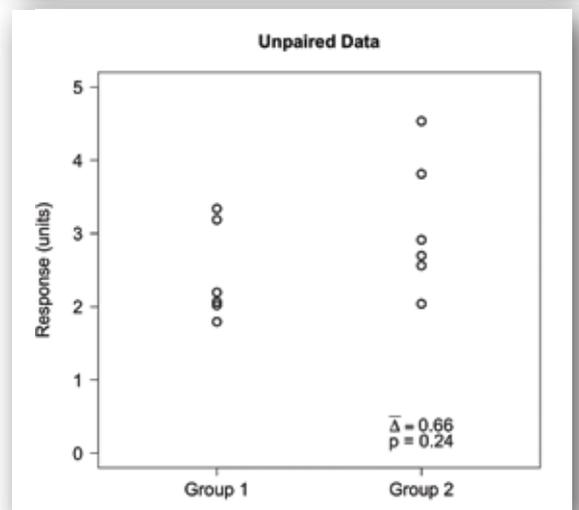
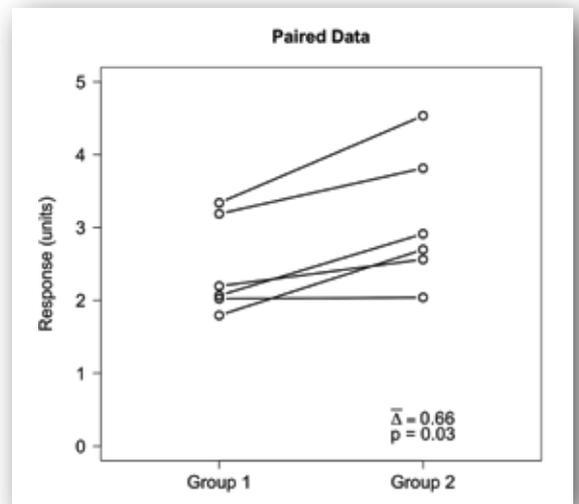


Figure 2—Below are two plots of the same data reflecting different designs. The mean difference and p -value from the associated Wilcoxon test are given.



Scientific Publishing **Dos** and **Don'ts** for Authors and Reviewers

What Do You Mean, I Already Published It!

Ethics in Scientific Publishing

From the May 2010 issue of the AAI Newsletter.

Based upon a presentation by Jeremy M. Boss, Ph.D., Professor and Chair, Department of Microbiology and Immunology, Emory University School of Medicine and Editor in Chief for *The Journal of Immunology*.



Jeremy M. Boss

Scientific manuscript submission and review processes are rife with ethical concerns—author designations, restrictions for the use and presentation of data, and reviewers' obligations for confidentiality, to name a few. Hard and fast rules for addressing these concerns sometimes elude us, for the specific circumstances of manuscripts may differ enough to introduce a number of "gray zones" requiring close examination. A few of the most frequently raised issues in scientific publishing are identified below. These important issues should be discussed openly between mentors and trainees, colleagues, and even editors.

What Constitutes Authorship?

The number of authors associated with a life-science paper can vary considerably, from one to ten or more authors for basic science reports to scores, even hundreds, for study group or medical trial reports. Who among all the people involved in the research process qualifies as an author?

The International Committee of Medical Journal Editors has established guidelines for addressing these issues. The ICMJE, formerly known as the Vancouver Group, (www.icmje.org) is comprised of a small working group of general medical journal editors who convene annually to review and define editorial standards. According to the ICMJE's Uniform Requirements for Manuscripts, to which *The Journal*

of Immunology ascribes, researchers must meet three requirements to qualify for authorship.

First, all persons listed as authors must have contributed substantially to the conception, design, and acquisition of data as well as the analysis or interpretation. Second, all authors must have been involved in drafting the article or revising and critiquing it for important intellectual content. Finally, all authors must approve the final version of the manuscript for publication. Some journals now even require the identification of one or more authors as "guarantors" who take responsibility for the integrity of the manuscript—from inception to publication. Contributors to the publication who do not meet all the criteria of authorship should be listed in the acknowledgements section.

Who among authors should be listed as first author? The order for contributing authors' listings varies according to the scientific field. In some fields, authors are simply listed alphabetically. For biomedical science papers, however, the principal investigator (PI) overseeing the project is listed as last author, while the lead experimenter, usually a graduate student or postdoctoral fellow is listed first. Inter-laboratory collaborations, which often involve substantial amounts of input from two or more laboratories, present special challenges for defining first authorship. If, indeed, the contributions of two individuals

are equal, some journals, including *The JI*, will allow dual first authorship for researchers.

Dual Submissions

Unlike job applications, manuscripts cannot be submitted to multiple journals simultaneously for consideration. Most journals, including *The JI*, have authors attest to their compliance with this policy. If allowed, multiple submissions would overload the peer-review system. Multiple reviews for each manuscript would dramatically increase the workload of reviewers and editors alike. Reviewers are often solicited by more than one journal in their field and could conceivably be given the same manuscript to review for two or more publications. In this scenario, the reviewer would have to recuse him- or herself to avoid ethics violations of reviewing a paper simultaneously for two journals. Searching for another reviewer would burden the editor and slow the review process. The quality of publications would also likely suffer if multiple submissions were the norm, for authors would be tempted to "shop" their manuscripts, selecting journals with the least demanding reviewers.

Duplication of Data

When is it permissible to republish data? The simple answer is “never,” though there are certain exceptions.

Data described in an abstract for a scientific meeting may be republished as long as the data are not part of an extended abstract with figures. Because these figures are in fact published with the abstract, the work is essentially published. Remember, changing the format of the figure does not alter the prohibition. The data may appear as a dot plot in one manuscript and a bar graph in another, but, if the source is the same, the data are the same.

Another exception exists for data published in Ph.D. dissertations or Master’s theses. Most journals, including *The JI*, will allow reuse of such data. The converse applies also. For articles published in *The JI*, copyright permission is automatically granted upon request for inclusion in a dissertation. Be sure to check with other journals regarding their policies. In rare circumstances, publishers will approve a secondary publication of an article in its entirety or in large part. For example, in its Pillars of Immunology section each month, *The JI* features an article, sometimes originally published elsewhere, that is regarded as a seminal work in immunology. The article is reprinted in full with editorial permission from the original publication and accompanied by a solicited commentary. In all cases of republication, the author must obtain editorial permission from the primary publisher prior to submission to a secondary publisher.

Reusing Experimental Data Sets

You may be tempted to reuse controls for frequently run experiments. If at all possible, DON’T. Data are rarely perfectly reproducible, so the chance that the control from one experiment is appropriate for another is highly unlikely. Sometimes, however, data for a group of experiments are collected together and the controls are the same.

If you are publishing these data in separate figures within the same paper, you should indicate that the controls are the same and specify as much in the figure legend and the methods section. If the controls in a figure (such as the example above) were previously published in another paper and are necessary for the interpretation of the current data set, this fact must be clearly cited in the text and legend. If you do reuse controls, you must obtain permission from the journal that first published the work to avoid copyright issues. Your best course is to repeat the experiment and state that the data are similar to those published previously. Be sure to provide the correct citation. Alternatively, you can simply cite the manuscript and figure that show the data.

Data Manipulation

With the introduction of computer software for digital image manipulation, data sets are sometimes altered to improve the visual effect of the figure. Sophisticated software programs offer tantalizing features such as 256 levels of gray and the ability to augment specks, crop images and vary tone. Take care, however, that these software “toolboxes” are not used to force interpretations. Manipulation of the data can distort and alter the data, leading to misinterpretation and/or misrepresentation of the experimental results. The best approach to making figures is to be mindful of how you design your experiments so that you do not have to manipulate your data after the fact.

If your data are not correctly organized, it is better to rerun the experiment with all the samples to get the lanes correct and get the right exposure than to “cut and paste.” In short, do



nothing or as little as possible to alter your data images. If modifications are made, indicate any change in the figure and figure legend. Any change to an image must be applied to the entire image (i.e., brightness/contrast). If bands are rearranged post facto, add lines denoting where an image was spliced. Never splice images from two separate experiments into a single image. To ensure against unintentional manipulation of your data, place molecular weight standards on gels to keep the orientation straight. Always keep originals, and keep a log for the file.

Plagiarism

To establish the context of their scientific findings, scientists must continually describe previous work and restate what is known, so it is difficult not to borrow what has been previously said. Be very careful not to borrow so heavily that you commit plagiarism. According to The 1995 Random House Compact Unabridged Dictionary, the “use or close imitation of the language and thoughts of another author and the representation of them as one’s own original work” is plagiarism. It is always best to fully acquaint yourself with your subject matter and then describe it in your

own words. If you are certain that someone else has said it perfectly and you cannot express it as well or better, place the citation in quotation marks and attribute it to the previous work. Because one's own scientific research niche can become largely repetitive, with the same assays and types of experiments being run over and over again, you may be tempted simply to copy and paste sections of introductions, discussions, and the materials and methods sections from one's own previous documents. Don't do it! Using your own previously published work without proper citations also constitutes plagiarism. The solution is simple. Rewrite the section, tailoring it to your new set of experimental results.

Citations should be used appropriately. It is best to refer to the actual paper in which the work was first reported. Some argue that this is the only legitimate citation. Certainly, do not list citations simply because they appear in related manuscripts. Your citations should specifically represent your body of work. In your list of references, be sure to include the original paper(s) describing the experimental procedures and scientific ideas most relevant to your work. You should not simply cite papers of authors whose use of the materials is similar to yours as a substitute for describing your methodology. Neither should you cite only review articles that broadly cover these matters.

Providing only layered references—references that refer to a paper that refers to a previous paper that refers to yet another previous paper—is not only frustrating to the reader seeking crucial information, but potentially misleading concerning the “developer” of the original reagent or idea. For example, when you use a cell line, list in your references the original paper that defined the cell line. If you cite only a paper that describes a use of the cell line similar to your own your readers might mistakenly conclude that the authors of this reference

actually developed the cell line. By carefully researching the history of your citations, you might even discover that it was actually your new boss or your colleague across the hallway that developed the key idea or reagent of your manuscript! Scientists deserve enduring credit for their discoveries, so be meticulous.

Review and Confidentiality

Reviewing manuscripts exposes researchers to new information before it is published, and it can be tempting to use this information to further one's own research. According to *The JI* instructions to reviewers, a “manuscript under review is a privileged communication, a confidential document not to be shown or described to anyone except to solicit assistance in reaching an editorial decision.” To ensure that the contents of manuscripts are not inadvertently shared, journals require of reviewers and editors to destroy all manuscripts (including figures) once the review process is completed.

Mentoring is an important part of scientific training, and many well-meaning researchers allow their postdoctoral fellows to review articles which they, themselves, have been solicited to review. Clearly, it is good training for students or fellows to review manuscripts. You may ask, “Where else would they learn how?” Often, principal investigators assert that their students are really the experts of an area within their laboratory and that they fully trust their judgment. Yes, maybe so, but it was you, the experienced researcher, who was solicited to review. Ask yourself whether, in all honesty, would you want someone else's students to be the reviewer of your papers? The best scenario, one that affords experience but does not lower the quality of peer-review, is for students to read and critique already published papers with the PIs. PIs can also share the reviews that they have received on former papers and allow students to

generate the point-by-point responses to these critiques. If, as a reviewer, you feel strongly that your student or fellow is highly qualified for the job, you should inform the editors that you plan to involve the student when you agree to review. The editor can then decide if they are really interested in having you do the review. If you fail to do that, let them know afterwards that you received help. If your name is associated with the review, you are certifying that you personally read the paper carefully and that the ideas expressed in the written review are, indeed, your own. Finally, all who will read the manuscript must agree with the confidentiality of the materials before viewing the manuscript.

Possible Conflicts of Interest

If you have any financial connections that constitute a conflict of interest, or have the appearance of constituting a conflict of interest, turn down the review. Do not even download the paper. If you are a competitor of one or more authors on the paper, ask yourself the following questions:

- Can I separate myself and provide a fair, unbiased review?
- Will I let my personal feelings for this author affect my decision?
- Will what I read change the direction of my laboratory?
- Is the author affiliated with my own institution?

If there is the slightest possibility of a “Yes” to any of these questions, politely decline the request to review. And if one of the authors is a buddy, student, spouse, or former boss, do not hesitate to turn down the review!

Summary

Abiding by these disciplines benefits science. By upholding accepted standards of conduct, we uphold the quality of peer-reviewed journals and the quality of information upon which we base future research and endeavors.

Scientific Publishing **Dos and Don'ts** for Authors and Reviewers

How to Be a Valued Reviewer

From the November 2009 issue of the AAI Newsletter.

Based upon a presentation by JoAnne L. Flynn, Professor, Department of Microbiology and Molecular Genetics, University of Pittsburgh School of Medicine.



JoAnne L. Flynn

Invitations to review manuscripts are often met with ambivalence, for reviewing is a time consuming and challenging task. Why, then, would anyone want to be a reviewer? Let alone, one in demand? Certainly, reviewing articles for *The Journal of Immunology* or other peer-reviewed journals is an important service to the research community, for the process of vetting articles is undertaken as a safeguard against the publication of non-reproducible or redundant data.

There are also benefits that accrue directly to you, the reviewer. Serving as a reviewer can help you stay at the cutting edge of your field, exposing you to the most recent scientific findings and developments and introducing you to other scientists in your specialty. Reading manuscripts and the comments of second reviewers can also provide insights into how to improve your own papers and better design experiments. Furthermore, becoming known as an expert and good reviewer in a field can lead to other career-building opportunities such as editorial appointments and solicitations for written commentaries or talks.

The Etiquette of Reviewing

There are, indeed, many reasons to serve as a reviewer. When asked to review a manuscript, however, carefully assess its scope and focus to determine if you are truly qualified to provide a good assessment.

If you can commit to the review, maintain good etiquette. Be a timely reviewer. Remember how agonizing it

is to wait for reviews. If, for any reason you cannot meet a deadline, contact the editor and journal staff right away. If you have to decline the review, do so quickly after being asked, and state your reason. Also, try to provide one or two appropriate substitute reviewers.

When you sit down to read the manuscript for the first time, start with the assumption that it will be a good manuscript. Do your homework, brushing up on the subject and researching the latest literature. Your review should refer to relevant work by others that might contradict or reinforce findings of the author. Be sure to provide complete reference information. (The review should not refer to unpublished data.)

Opinion vs. Bias

Reviewers, as recognized experts in a given field, are asked to give their opinions on the validity, significance, and originality of the findings presented in manuscripts. Reviewers' opinions also weigh heavily in determining the suitability of the manuscript for a particular journal. You must, however, carefully guard against letting your biases unrelated to the science cloud your judgment. For example, it is not constructive to dismiss a manuscript summarily with a remark such as "We don't need a monkey model of TB." Remember, too, to keep focused on the science, for that is what is being reviewed—not the authors, not the country, and not the institution.

Review what you know. Use your expertise. You do not need to review

all parts of a paper if there are sections that you believe you are not qualified to judge. Indicate as much to the editor but don't be lazy. Do not pass up anything you could reasonably explore.

Conflicts of Interest

In deciding whether you are qualified to review a manuscript, be sure to look carefully for any conflicts of interest. If you recognize a potential conflict of interest, decline or alert the editor. Remember, conflicts of interest come in all hues. Any one of a number of past or current relationships can prejudice your review, positively or negatively. You may have a conflict if one of the authors is a competitor or if you are working on exactly the same aspect of a subject. If you are a recent or present colleague, have co-authored papers, served on a committee together, or served as a mentor or been mentored by one of the authors, you may have an issue. The world of science, however, is very small, and you cannot completely avoid reviewing papers from people you know. You must decide if you are capable of fairly reviewing a paper objectively. If you are concerned about the potential for conflict, discuss your concerns with the editor and journal staff. It is best to err on the side of caution and avoid even the perception of a potential conflict of interest.



A Professional Tone

Professionalism in the review process is essential. The reviewer's anonymity does not give one license to be mean. Avoid personal or disparaging comments. Do your best to give constructive criticism—the kind you expect from your own reviewers. During the process, remember how unhelpful and painful it is to get a nasty review. Be clear in your comments to the authors:

- Is the study design flawed?
- Can the authors reasonably remedy the problems?
- Are there problems of methodology or interpretation?
- Is there too little data, or is the study missing controls?
- Can you help the authors make it better?
- Is it poorly written or organized?

State your case in a clear and defined way. Always be fair. That is, do not ask for experiments that are impossible or beyond the scope of the manuscript. Ask yourself, “What is needed to finish this particular story?” and not “What should be done to finish an entire project?” Good experimentation always leads to more questions, so do not expect all questions to be answered.

Statistics are the Achilles tendon of most researchers. Reviewers, however, must evaluate the validity of all statistical findings. Is a finding biologically significant or merely statistically significant? Take a close look at all the figures. Do any of the figures lack error bars or other statistical analyses? Look for the use of incorrect statistical tests, insufficient repeats, and nonsensical numbers. Are there extenuating circumstances that the authors failed to take into account and should be addressed in the manuscript? If you are weak in the use of statistics, be sure

to get help with the review of the statistical modeling or analysis. (In doing so, be sure not to “expose” the manuscript).

The Issues

Sometimes serious problems arise during a review. Unfortunately, misconduct does occur. Be on the look out for the use of previously published data without attribution and plagiarism of previous publications, including those of the authors. With the availability of software that can manipulate data, falsifying data has, unfortunately, become more commonplace, so do spend time considering whether the data has been inappropriately manipulated or modified.

You should include within your review suggestions for how to improve a paper. Ask yourself the following questions and address appropriately:

- Is there extraneous data or discussion?
- Can the work be repeated from the methods?
- Are the conclusions justified?
- Are all figures relevant and necessary?
- Can it be shorter or more succinct?
- Does the writing style need major work?
- Is there an English problem?

Most journals ask for “Comments to the Editor” in addition to comments to the authors. In your comments to the editor, consider the following:

- Are the findings sufficiently novel and exciting for that journal?
- Is there something to say to the editor that you would not/should not say to the authors?
- What would be necessary to raise the article to the level of acceptance?
- Do you want to see it again as a revised manuscript?
- If you believe the article should be rejected, state clearly why.

The peer-review process must remain confidential to protect authors' ideas and data. Do keep the manuscript to yourself. Do not alert potential competitors to the existence of the paper, and, under no circumstance, share any of the findings.

In short, review the way you hope everyone else is reviewing your manuscripts. Editors and your peers will be grateful for your professionally conducted reviews. You'll benefit from the discipline, too!



The American Association of Immunologists
9650 Rockville Pike, Bethesda, MD 20814 -3994
Tel: 301-634-7178 • Fax: 301-634-7887
Email: infoaai@aai.org