

Academic Publishing, Part III: How to Write a Research Paper (So That It Will Be Accepted) in a High-Quality Journal

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Since I began reading the scientific literature when I was a student, I have had a bucket list of journals that published work I admired, and in which I eventually wanted to see some of my own work published. Getting papers into some of those journals (no, I have not yet completed the list. . .) has been a very satisfying part of my career. Along the way, as an author, reviewer, and editor, I have learned a great deal about how to prepare a paper so that it has the best chance of making it into my journal of choice. In the first 2 segments of this series, we explored the peer review process and how to choose a journal in which to publish your work. In this article, we will discuss the process of writing a research paper to maximize the chance of its being accepted in your first-choice journal.

Write for the Journal to Which You Plan to Submit

It may seem axiomatic that your paper will have the best chance of being published in a journal if you prepare it specifically for that publication. However, it is surprising how often authors do not do this. In Part II in this series, I advised that writers should choose the journal in which the work would best fit, based on what they typically publish. Reading typical papers in that journal should also give you a good idea of what the editors are looking for regarding style and organization.

Different journals have specific formats. *Annals of Neurology* uses the classic style of a separate self-contained Abstract, followed by an Introduction, Methods, Results, and Discussion. Some journals make the

first paragraph of the Introduction serve as an Abstract, place the Methods at the end of the article, or combine some components of Results and Discussion. Although the remainder of this article will address the writing of a manuscript that is organized in the format used by *Annals of Neurology*, you should be sure of the format used by your target journal, and write your paper in that style.

Another key difference between journals is how they position themselves in the "intellectual space" of their fields. For example, some high-visibility journals are looking for papers that are particularly newsworthy. Simply providing a paper of high scientific quality may not be good enough for them. Other journals have a predilection for papers of a certain type (eg, basic science, clinical trials, case reports) or for work in a certain subfield (eg, cognitive, demyelinating disease, neuromuscular). These preferences are often driven by the taste of their editors, so it can be useful for authors to review the list of editors and members of the editorial board, whose own work often defines the intellectual space in which that journal is most comfortable.

Although your work will, of course, define its own field, it is often possible to target it for a specific journal, by deciding which components of the study to put into that manuscript, what types of analyses you want to present, and which ideas you want to emphasize in your paper. Writing your paper specifically for that audience of editors is a key strategy in getting your paper accepted. Conversely, if you find that the intellectual space of the target journal is different from what your

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paper addresses, it is generally better to find a more hospitable journal than to try to push your work into a less welcoming environment.

Make Your Writing Concise and State Each Point Only Once

Many new authors start laying out their Results section, or their figures. They then back into writing an Introduction, which is often rambling because it seeks to cover every point in the Results, and then a Discussion, which often repeats points made in the Introduction. This leads to a paper that is too long, making it difficult for a reader to glean the key points. Experienced reviewers often report back that a paper reads as if it were written by a graduate student or a resident (ie, a neophyte).

The key to avoiding this syndrome is to plan your paper in advance. The hardest part, and the part that deserves the most thought, is how you frame the problem you are studying intellectually. This choice should be driven by the work itself, of course, but should also match the style of the target journal. For example, a given study may report a novel scientific finding that has implications for human health. For a high-visibility scientific journal, the authors may choose to emphasize the biological novelty of their findings and the implications for further work; for a clinical journal, the authors may want to rewrite the paper to emphasize the relevance to human disease and its treatment.

Once you have decided how to frame your work, you need to look back at the results, and organize them in a way that fits that emphasis. For example, you may want to include some findings that have interesting neurobiological implications for a basic science journal, but perhaps remove those and instead emphasize the disease-related aspects for a more clinical journal. You will find that you can (and almost always will) leave some components of your study on the cutting room floor. What you choose to include and what you leave out will depend in part on the way you frame your problem, and the journal for which you are preparing the paper.

When you have identified the components of your results that you want to include, it is time to lay out the points that you want to make in your Introduction and Discussion. We will discuss below the types of material you may want to include in each. However, at this point, it is important to emphasize that each major point should be discussed in detail only once. It is important to decide if the detail will be in the Discussion (where it usually fits best) or in the Introduction (if it is needed to set up the scientific problem).

The Introduction Should Concisely Frame the Problem; Avoid Using Too Many Abbreviations

The Introduction should be written for a general reader in the overall field of the journal for which you are writing. If you are writing about a disease for a general neuroscience audience, it may require a much more substantial introduction to the disease than it would for a general neurology audience, and the latter may require more introduction than for a subspecialty clinical journal. Conversely, the amount of introduction given to the scientific method used to study the disease may have the opposite requirement (eg, less detail needed to introduce 2-photon confocal microscopy to a scientific audience, but a very detailed introduction for a clinical subspecialty audience).

Although the opening lines may give a general introduction to the field, the text should move as quickly as possible to the specific problem that the paper addresses. It is important here to sell your audience on the importance of answering the scientific question your study poses. This will draw in the reviewer of your paper, who will pay more attention to your subsequent results. A reviewer who finishes your Introduction without a strong sense of why your results will be important is not likely to be as impressed with the rest of your paper.

At the same time, it is important not to state your results and conclusions in the Introduction. Many neophyte writers do this, hoping that this précis will entice the reader to go on to the remainder of the paper. Not only is this unnecessary, but it may well set up the reader (who may not yet be convinced of the premise) to want to find flaws in your study, before actually reading it in detail. Let the Abstract provide the lead-in. The Introduction should end with a delineation of how you intend to go about solving the problem you have posed.

A common error made by inexperienced writers is to use too many abbreviations. A few abbreviations are necessary for long, bulky names that are repeated frequently in the text, but if you find yourself using more than about 6 abbreviations for the entire paper, you are probably using too many. A good test is to look at the last paragraph of the Abstract or Introduction. If it reads, to a naive observer, as if it were written in code, you are using too many abbreviations.

The Methods Should Allow an Investigator in Your Field to Repeat the Study

The Methods in many journals have been relegated to second-class status. Some put them at the end of the published text, as if they are a distraction that can be

kept for later, if necessary. Some high-visibility journals banish the Methods entirely to online supplementary material. While the Methods do take up valuable page space, the editors of *Annals of Neurology* continue to believe that it is not possible to really interpret Results unless you understand how they were obtained. For that reason, we have kept the Methods in the traditional position, between the Introduction and the Results.

Regardless of the style of the journal that you choose, it is still important to make sure that the Methods you give would allow a reasonably skilled competitor in your field to replicate the work you present. This may seem to be a bother, and some writers hesitate to give away too many of their “trade secrets” to their competitors. However, if the result is important, other investigators in your field are going to want to repeat it. If they fail, your reputation may be damaged.

The Methods should include very specific information about key equipment and reagents, down to the company from which they were purchased and the catalog number if appropriate. The information should be provided in a series of paragraphs on specific methods or types of experiments to be described. Be sure to include a paragraph on the methods of analysis, including statistical tests, and a paragraph on participant recruitment and consent, for studies involving human subjects.

The Results Should Lay Out the Findings in Clearly Demarcated Paragraphs; Avoid the “Travelogue” Approach

A common mistake made by inexperienced writers is to be led by the organization of the figures. The text then becomes a series of expanded figure legends (“Figure 1 shows that...”). This is similar to the travelogue presented by those who come back from a trip with a load of photographs to show their friends (“The next slide shows...”). Some presenters at scientific meetings also use this approach, which is a sure way to lose your audience. If you find yourself repeating details of the figure legends in your text, or vice versa, you are making an error in one of those two places (or both of them).

No one wants to be fed a series of graphs or photographs. They want to hear a story. Make your story organized, so it builds to make a point. Do not get lost in digressions (save those data for another paper) or confuse your audience with more detail than is necessary. Leaving out some details is difficult. By the time you get around to writing up a project, they are like your children, and you do not want to leave anyone behind. But you have to be ruthless in writing a paper, and focus your attention on the goal, not on the cloud of data you collected that eventually led to that goal.

Another common error is to put the results into chronological order. This is fine, if the logical order of presenting your findings also is in that order. But quite often, the results were obtained in a different order from that which provides the best and clearest story. In one high-impact paper that I published, the results were presented in exactly the opposite order to that in which they were obtained. That was because we had backed into the final result and conclusions, not expecting them when we started the project. However, once we knew what that result would be, it was simpler to explain the story when presented in the reverse order of the way in which the events actually unfolded. That surprise, which for us occurred at the end of the study, was exactly what made the result compelling enough to publish in a high-visibility journal, and it belonged at the beginning of the printed publication, to frame the rest of the experiments properly.

The Discussion Should Highlight the Most Significant Aspects of Your Work, Identify Its Limitations, and Discuss Its Meaning for the Field

The first paragraph of the Discussion section should concisely reprise the major findings of the study. This is your opportunity to put the spin you want on the observations you have collected, and paint the big picture for your reader. If you cannot make a case here for how your work has advanced the field, you are unlikely to do so, and many readers will stop there.

It is a good practice next to write a paragraph on the limitations of your work. All work has limitations, both in the ways in which the research was conducted and the ways in which the results can be interpreted, and you should make those clear. If you do not, the reviewers of the paper will do so, and your work will very likely not be published. If you address this first, and provide proper indications of the value of the work despite these limitations, you will have the upper hand in that discussion.

The remainder of the Discussion should be broken up into paragraphs that address important issues you want to address with respect to your data. Again, you are trying to tell a story, or a series of stories, about how your data change the field. This is the place to review the problems in the field, and to identify the place of your own observations in resolving some of those problems.

Many writers include some sort of a résumé at the end of the discussion. This is not really needed, because your Abstract provides that. Instead, it is worthwhile to devote some space to projecting out into the future,

identifying the new avenues of investigation opened up by your observations.

Write the Abstract Last to Make Sure That It Matches the Intent of the Rest of the Paper

Many writers try to prepare the Abstract first because it is the first thing a reader will see when encountering the paper. However, if the writer has done a good job on the rest of the paper, it may have developed in ways that might have been unexpected when the data were first collected. Some data that turned out to be a distraction may have been dropped, or the results may have been put in a different order to emphasize a certain set of findings. It is often easier to write a compelling abstract that will cause the reader to want to read the rest of the paper only after the rest is already written.

“There Is No Such Thing as Good Writing, Only Good Rewriting”

This quotation, which is variously attributed to Robert Graves or to Supreme Court Justices Louis Brandeis or Oliver Wendell Holmes, Jr, remains as true for scientific writing as it does for literature or judicial decisions. It is important to get your first draft down, but you should plan to let it sit for a week or so, and then return to it ruthlessly, cutting and slashing to improve both the flow of the paper and your prose. Ask a few trusted colleagues to read your work, and to give you suggestions for how to improve it. It is best to have some senior mentors who have experience as reviewers or editors, particularly early in your career. It is also important to listen to them. One of my students, for example, had a tendency to write in a prolix style. The first draft of one paper was 110 pages long! I used a red pen to mark up the draft on paper, and cut it about in half. When it came back to me it was still over 100 pages. After several rounds of this (and red pens), he became restless with my editing, and I told him to see what would happen if he sent the paper in. He did submit it, and the first review came back: “This paper would have been great in the day of Charles Darwin. . .”

Finally, plan to rewrite and revise your paper multiple times, over a period of weeks. Frequently, when I go back to a paper after a week or so off, I find that I can improve it considerably. Always look for ways to streamline your text. A common complaint of reviewers is that a paper is 20% or 30% too long, but I have never seen a referee complain because a paper was too short! The classic paper in *Nature* by Watson and Crick on the structure of DNA was 2 pages long. Your work will have the

greatest impact if you can reduce the text to that which is essential to make your point.

Make Sure Your Figures and Tables Fit with the Text, and Are Cited in Order

The figures and tables should be used to document the key findings that you describe in the text. It is just as important to edit these, providing only the clearest examples in your paper. The usual standard for a photomicrograph is to show your typical best case, that is, a case that typifies the data most clearly and convincingly. It is very important to cite the figures and tables in the text in order of appearance. Do not number your figures until after you have actually placed those citations, or things may get very confusing.

Read the instructions for figures for your target journal. Make sure that you provide them in the format that is required. Generally, most journals use the same standard as *Annals of Neurology*, in which you submit the text, references, tables, and figure legends (in that order) as a single text document, but then upload each figure as a separate file. Make sure that the figures have sufficient resolution for publication. In general, you can do this by sizing them to the journal page, and then submitting them at 300dpi resolution at the size in which they would appear in the printed journal.

A Final Word

Once you have finished your paper, it is critical that you submit it to your coauthors (and those who are acknowledged) for their approval before it is sent in. Be sure to write a careful cover letter, which should state (briefly!) the main point of your paper. You should suggest some referees who are knowledgeable about the field. Some journals permit you to list referees who you think should not be chosen as reviewers. Be careful here to list only those who have real conflicts with you or your coauthors, not a list of everyone you think might give your work a critical review. The latter often leads the editors to ignore your request (and to wonder whether the work will stand up to critical review).

After the paper goes in, you can relax, at least for a little while. In general, most journals that operate efficiently take about 5 weeks on average to deliver a decision. The standard deviation on that is about 1½ weeks, so if your paper is not returned in 8 weeks or so, you should feel justified in writing to the editor (but not before that). Some authors request rapid review of their work. In my experience, this only works if the paper is groundbreaking work of earthshaking importance. Trying to accelerate the review of a paper that the reviewer will view as average in the field typically results in a reviewer

who feels imposed upon, and almost always leads to a worse review (and often a more prolonged wait for the review) than if the process were just allowed to run its course.

Good luck with your paper, and if the review is not what you want, remember that there are a lot of other journals out there. As I alluded to previously in this series, the sweetest revenge when your paper has

been turned down is to publish it somewhere else and have it become a mainstay of the field.

Potential Conflicts of Interest

Nothing to report.
