



# The triad of scientific publication: Reading, writing, and reviewing



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## ABSTRACT

A workshop on scientific publication was presented at the 2013 ISFG conference by the author, who has written four widely used textbooks and 150 peer-reviewed articles and invited book chapters. This article is a summary of key points made during the workshop. Slides from the workshop are available on the NIST STRBase website at <http://www.cstl.nist.gov/strbase/NISTpub.htm>.

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## 1. Introduction

Effective communication is important to advancing quality science. Scientists publish their work to share knowledge with others and to gain recognition and prestige for their efforts. In university settings, publication improves academic standing and opportunities for research funding. Scientific publication involves three important efforts: reading, writing, and reviewing.

## 2. Reading

Reading the literature in a scientific discipline develops expertise as new advances are better understood. Extensive, careful reading can also improve writing skills and the quality of scientific work performed. Relevant reference lists and insightful introductions to new manuscripts result from a knowledge base developed through reading the current literature. In graduate school, I began what will hopefully be a life-long effort to collect and study articles relating to forensic DNA typing. What began as a collection of 687 articles used for my PhD dissertation has now expanded to almost 9000 articles cataloged in a Reference Manager database. I have used several methods to locate articles that may interest me ranging from examining a physical copy of a journal to viewing a table of contents on-line to directed searches using tools like PubMed [1].

Scientific articles are not designed to be read like novels nor does every aspect of an article always have to be fully comprehended. I first skim an article and scan the tables and figures and their captions. Next I examine results and conclusions

to see if the data presented support the statements made. I skim most articles rather than reading them from start to finish in their entirety. I highlight key points and make notes on a printed copy of the article so that I can go back later and quickly find the portions of the paper that were most interesting to me. I find the reference listing of an article important as a way to assess the attention to detail that authors have and to find other potentially interesting articles.

An appreciation for good writing is developed through careful reading of many articles and books.

## 3. Writing

An important purpose of scientific publication is to document work performed to aid the advancement of science. In short, writing enables history. Work conducted in the present, which hopefully will benefit the future, grows from knowledge of the written past. Numerous journals exist for sharing information with a diverse audience of scientists.

Selection of an appropriate target journal for your work is an important first step in writing. Journals have submission guidelines to help authors in formatting their manuscript. Journal editors appreciate when these guidelines are followed.

An efficient writing process begins with an outline, which is a short written plan for organizing how data will be shared [2]. After the manuscript scope is defined, often with input from co-authors, supporting text can be built around the outline. Word processing programs have greatly aided the speed and ease of writing.

As the first author on a manuscript, I typically begin writing the Materials and Methods section to describe the experiments performed. Of course, if I am writing an article with co-authors, then I regularly seek their input as appropriate. Next I prepare figures and tables to help describe the available data. Captions should concisely describe information contained in the figures and

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tables so that they can stand independent of the text. The Results and Discussion sections are written to provide text to the figures and tables followed by the Introduction to provide context and purpose for the article.

My preference is to note any appropriate references in the text as I am composing my manuscript and then complete the citations in full at the end of the writing process with the required journal format (using a tool such as Reference Manager [3]). I often gather physical copies of the cited articles in order to refer to them while I am writing. Finally, I write the abstract and create a meaningful title. An article's title and abstract are crucial items since they will be read most. Selecting appropriate key words along with descriptive titles enables interested readers to locate your work once it is published.

Authorship brings both credit and responsibility. Co-authors should read and agree with the final version of a manuscript prior to submission. The acknowledgments section exists to express appreciation for those who have contributed to your work but perhaps not enough for authorship. Many journals now require the role of each listed author to be described. Always acknowledge funding sources and disclose any potential conflicts of interest. Some institutions require a disclaimer statement.

Active author and two-time Pulitzer Prize winner David McCullough has described the process of writing: "Writing is thinking. To write well is to think clearly. That's why it's so hard" [4]. I find that I need a quiet place to work with no interruptions in order to get into the flow of writing. The best time for me is often late at night when I can focus and write for several hours uninterrupted.

Creating clear, flowing concepts in my experience requires significant effort and many re-writes. I may review a manuscript dozens of times as I polish the words in an attempt to clearly convey my thoughts. I often read my text aloud as I try to think about how the words might be received from a reader's perspective. This requires knowing the audience you are trying to reach and thinking of them as you write. Short sentences and regular paragraph breaks enable readers to stay more focused. Create meaningful tables and figures—but not too many in the portion of your manuscript intended for print. With the advent of electronic publishing, supplemental materials can be shared online.

George Gopen and Judith Swan wrote a classic article in 1990 [5] with useful recommendations to improve the accessibility of written scientific communication. More recently, the journal *BioTechniques* provided a series of articles with helpful tips in preparing manuscripts [6]. Writing can improve with study and lots of practice.

#### 4. Reviewing

The editors of peer-reviewed journals rely on input from scientific colleagues to judge the merits of submitted manuscripts. For the peer-review process to be successful, knowledgeable reviewers are needed [7]. Timely feedback from reviewers enables editors to make decisions on whether or not to accept an article that has been submitted. Good reviewers provide objective feedback to editors and constructive comments to authors. If reviewers supply sufficient detail and reasons for needed

corrections, then authors may use that feedback to improve their writing.

When I review manuscripts, I like to print out the article so that I can mark corrections and comments on it. I first skim the article to get an idea of the material being covered. I review the title, abstract, and conclusions and then proceed to read the text carefully. I examine the reference list for consistency, accuracy, and format. If authors are sloppy in their citations, then they may not be paying attention to detail with other aspects of their experimental or written work. After fully examining the article, I submit my review to the journal editor with a recommendation of acceptance, revision, or rejection based on clear comments to the authors that begin with my major concerns and conclude with minor issues. As I provide these details, authors are given an opportunity to improve their work if they so choose.

Reviewing manuscripts is a chance to influence the community for good and to provide service back to journals that have previously published your work (or perhaps a journal where you would like to submit in the future). Having reviewed hundreds of articles for more than two dozen different journals over the past two decades, I know that reading the literature and reviewing journal submissions have made me a better writer.

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#### Conflict of interest

None.

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