Be a Better Author

The "Suggestions for Contributors" pages that appear in this journal from time to time give the bare essentials of preparing a paper for submission. This essay offers suggestions that go beyond the basics and help authors prepare their papers with finesse.

The purpose of scientific journals is to transmit information from writers to readers. If a paper already conveys the facts of the research, why should its author be concerned about finesse? There are two basic reasons.

First, a well-written paper will be more readily understood by the reviewers. This means the paper will stand a better chance of being accepted and will be published in less time with fewer revisions.

Second, the readers of the journal are more likely to read and understand a well-written paper than a murky and poorly presented one.

The reviewers and readers of this (and every other) journal are busy people. They have their own research to conduct and their own papers to write. On top of that, they have other demands on their professional and personal time. When faced with a murky piece of writing, readers may make an honest effort to read it. If they cannot decipher the paper immediately, they probably will set it aside. After a couple more tries at reading the article, they are likely to decide that the benefit is not worth the effort.

An outstanding piece of writing will be widely read, widely quoted and cited, and will bring great rewards to its author. The secret of producing an outstanding piece of writing is always to keep the reader in mind. Authors who keep readers in mind convey their information more lucidly than authors who write only for themselves.

The scientist who has the attitude, "Why should I worry about how this is presented?; everybody *knows* what I mean," is incorrect; everybody does *not* know. The person whose native language is not English may not know; the student may not know; and other scientists in similar fields may not know. The thoughtful scientist-writer keeps these people in mind.

Title

A good title will attract readers who might not otherwise read the paper. That's why the specifications call for 6 to 12 words, no abbreviations, and no Latin names if an English name is available. Begin with the key words, not with a low-impact phrase such as "Effect of . . ." or "Influence of . . ." Eliminate ambiguous words.

Abstract

The abstract should be meaningful by itself, not a teaser. It will be read by 50 to 500 times more people than the full paper. Therefore, the abstract should convey information itself, not just promise it. Never use such phrases as ". . . are described" or ". . . will be presented" in an abstract. Instead, describe them, present the information. Always begin the abstract with rationale and objective statements; never jump directly into the materials and methods. When a person reads an abstract that begins, "The effect of chemical A on plant B was studied . . ." that person has the right to ask, "Why was it studied?"

General Suggestions

Adhere to the style spelled out for ASA-CSSA-SSSA journals. Edit your paper carefully to eliminate spelling, punctuation, and grammatical errors. Even after you are finished and you know the paper is perfect, lay it aside for a few days and then read it again.

Check the accuracy of your references scrupulously. Many papers arrive at a reviewer's desk with incorrect dates, titles, and author names in reference lists; or one year of publication or spelling of the author's name in the reference list and another in the text citation.

Scientific editors and Headquarters editors are not supposed to rewrite a poorly written manuscript; that responsibility rests solely with the author. If you have difficulty writing scientific English, consult a colleague who writes well, or seek the services of a professional editor who will help you for a fee. We can provide names and addresses of ASA, CSSA, and SSSA members who have volunteered to help authors whose first language is not English.

Writing the Paper

Organize your paper so that it answers four basic questions:

1. What did I set out to do and why? *Introduction.*
2. How did I do it? *Materials and Methods.*
3. What did I learn? *Results.*
4. What does it mean and how does it relate to what else is known? *Discussion and Conclusions* (and *Summary* also, if the paper warrants one).

In the introduction, discuss only work that is directly related to the work you are describing. Don't cite every paper written on the subject; cite only the most important ones or key review papers. Three or four citations (never more than six) are plenty to corroborate a statement.

Avoid repetition; don't repeat the abstract in the introduction or the introduction in the discussion. If you give a botanical name, chemical name, or a soil description in the abstract, don't repeat it in the text. However, do repeat some of the information from the text in the captions for the tables and figures, because *readers generally study the tables and figures before they read the text.* In the text, refer to tables and figures.

Don't mix fact and opinion; when you include opinion or speculation, clearly label it as such.

Be concise, don't ramble. Short, concise papers are more likely to be accepted than long, rambling papers (and will cost less to publish).

Constructing the Sentence

Scientific writing contains far too much use of passive voice. Regardless of what anybody tells you, it's okay to use first person in scientific literature. You don't have to say "the research was conducted," you may say "we conducted the research."

The passive voice is correct and useful in scientific writing whenever the reader does not need to know who or what performed the action described ("The plants were watered once a day"). The passive, however, tends to be overused by scientists, and sentences can become wordy ("It is thought that the excellent results obtained with this instrument were greatly facilitated by the care that was taken to calibrate it with model X7"). Where appropriate, change the passive to the active voice:

> We think that careful calibration of this instrument with model X7 was largely responsible for the excellent results we obtained.

Or better:

> The excellent results we obtained were largely due to careful calibration of this instrument with model X7.

In general, the past tense is correctly used (1) for observations, (2) for completed actions, and (3) for specific conclusions:

1. The insects weighed 0.5 g each.
2. They reached the end of the road.
3. The experiment was a success.

The present tense is used for generalizations or general statements ("This machine is the most successful of its kind").

Avoid using *and/or*, which usually confuses the reader—fortunately, it is almost always unnecessary and can be changed by

using plain English at the cost of a couple extra words. For example:

"The plant has a slow rate of seed and/or fiber development once it reaches maturity" becomes "The plant has a slow rate of seed development, fiber development, or both once it reaches maturity"

With very few exceptions, don't write sentences that require use of the word *respectively*. Too many sentences in our journals are constructed in this manner: "Water contents were 92, 128, and 280 g kg^{-1} for samples 5, 6, and 18, respectively." It is much easier to read and decipher: "Water contents were 92 kg ha^{-1} for Sample 5, 128 for Sample 6, and 280 for Sample 18."

Word Use

You can eliminate some words without changing the meaning of a sentence. The word *located* is a good example; it can be eliminated from almost every sentence without any loss in meaning. "The plots were located near Ames, IA." is better as, "The plots were near Ames, IA." Both sentences convey exactly the same meaning; the word *located* adds nothing. Similarly, the word *that* is unnecessary in many sentences. Here are two other words that can be deleted:

prior history (all history is prior)
careful examination, **careful** study (would you do it any other way?)

The following four phrases, which frequently appear in scientific literature, could be eliminated and never missed:

it is shown that	it is a fact that
it is emphasized that	it is known that

Other words are used to mean things they never were supposed to mean. A good example is the word *over*; it means *above*, but authors use it incorrectly to mean such things as:

Correct word(s)	Incorrect use of "over"
with, during	growth over time, happened over the weekend
onto	fertilizer was spread over the field
more than, >	took over 70 samples, yield increased by over 10%
from, across	pooled over three locations
of	two replications over six dilutions
with	changes in concentration over time
to	traffic applied over 100% of the soil
across	sampling was stratified over soil taxonomic groups, drove over the field
through	accumulated over the years
here	came over after work

Use English rather than Latin plurals for words that have become anglicized (formulas rather than formulae).

American and British spellings can also cause confusion. Note that our journals use American spellings. Following is a list of preferred word choices.

Examples of preferred word choices	
center	not centre
favor	not favour
catalog	not catalogue
fertilizer	not fertiliser
program	not programme
labeled	not labelled
occured	not occurred
gauge	not gage
acknowledgment	not acknowledgement
plow	not plough
chair	not chairman
human	not man

Watch out for irregular plurals (see below), and be sure the verbs agree with them.

Plural	Singular
phenomena	phenomenon
media	medium
criteria	criterion
symposia	symposium
genera	genus
analyses	analysis

Such words as *parameter*, *following*, *facility*, and many more are misused in scientific literature. Time does not have points, so there can be no such thing as a "point in time." Instead of saying "at this point in time," simply say, "at this time" or "now."

Here is a list of long words and phrases and a comparable shorter way to say the same thing:

Instead of	Use
appears to be	seems
in the absence of	without
higher in comparison to	more than
was found to be	was
in the event that	if
small number of	few
was variable	varied
additional	added, more, other
approximately	about
at the present time	now
establish	set up, prove, show
identify	find, name, show
in a timely manner	promptly
operate	run, work
prior to	before
in order to	to

Conclusion

Scientific writing is not difficult, but it also is not nearly as easy as some would think. Practically any scientist can write well enough to get by and be understood by a few. If you want to do more than this, take time for additional input, study, and practice. You could find a far higher percentage of your papers being accepted, or at least have your papers accepted more quickly, than they have been until now. Who knows, you might even become one of those rare scientists who write well enough to have an impact far outside your field of study, regardless of how narrow that field might be.

This short article was inspired by a paper in the journal *Neurology*. Several editors-in-chief, editors, and Headquarters staff editors developed the original article. Since then, a group of Headquarters staff editors worked together to update this article. Some ideas are taken from *How to Copyedit Scientific Books and Journals* by Maeve O'Connor, ISI Press, Philadelphia, PA (1986); and *The Careful Writer* by Theodore M. Bernstein, Atheneum, New York (1984).

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