Streamlining Your Scientific Article: Advanced Techniques

Karie Friedman
Former Assistant Editor
Reviews of Modern Physics
karie@fairpoint.net

The Challenge

The first job of scientific writing is to engage the reader and get him or her reading through your article without hindrance or distraction. This task is analogous to that of a car designer.

Streamlining a Car

To Streamline (verb): (1) to design or provide with a form that presents very little resistance to a flow of air or water, increasing speed and ease of movement; (2) to improve appearance or efficiency; (3) to simplify in order to increase efficiency.

What Is a Streamlined Article?

Unlike the car designer, we are not concerned with achieving higher speed, but we do want to keep the reader turning pages with interest and keep him or her from getting bogged down in slow places where the energy of the text lags.

Ways to Streamline an Article I
Engage the Reader

1. Present the problem—and you addressing the problem—not just your results.
2. Use reader-friendly cues and questions.
3. Make good figures and tables—they usually get read first.
4. Don't tell your reader what he sees.

Ways to Streamline an Article II
Keep the Reader Moving through the Article

5. Repair slack places by combining sentences.
6. Use pronouns to avoid repetition.
7. Aim for leaner, more vigorous sentences.
8. Avoid pileups of modifiers.
9. Allow equations to be part of a sentence.
10. Don’t overuse Thus, Therefore, and Hence.

Ways to Streamline an Article III
Pay Attention to Details. Errors Distract Your Reader.

11. Use more participles.
12. Use the right qualitative modifiers.
13. Check your manuscript for frequently misused terms.
14. Focus on results, not on “the Figure.”
15. Use appropriate tenses.
16. Try these two recipes for Abstract and Introduction.

Present the Problem—and You Addressing the Problem

Introduce the problem in a way that shares some of the intrigue that it held for you. Perhaps link it with some every-day phenomenon or say something about how you tackled it Not a blow-by-blow account of all the dead ends, but

At first we considered … However,

Get your reader invested in finding a solution and he may stay with you to the end of your paper.

Use Reader-Friendly Cues and Questions

Are you addressing your reader directly or merely composing a pre-recorded message? Here are some examples of reader-friendly cues (especially useful for transitions in theoretical papers).

Consider
Contrast this with
Let us suppose
Up to this point we have
A cautionary remark

The reader may well ask
Let us take a closer look at
Remember that
Indeed, we shall see
It is sometimes helpful to

Make Good Figures and Tables—They Usually Get Read First

- Make indices, labels and data points large enough to be legible at one-column scale!!
- Begin each caption with a title before discussing parts.
- For clarity, identify curve or data point before talking about it. The more information in the figure, the longer the caption.
- If it's your own figure, consider whether it is a good candidate for a cover. Could it be made so?
- Ideally, the series of figures in your paper should tell a story.

Don’t Tell the Reader What He Sees

The expressions in the left column are a bit awkward in English and also presume to tell the reader what he or she sees. Those in the right column are smoother and merely suggest what is there to be seen.

Not so good	**Better**
It is observed that	It can be seen that, we can see
One sees	one can see, we see
as is seen	as can be seen

You can bypass the observer(s) altogether by using
As shown in Fig. 4.

Combining Sentences I

Check for low-energy places where a subject is repeated from sentence to sentence. Sometimes these can be recognized by the presence of “such” or “such a”:

> We use a technique analogous to the one described by Toth [24]. Such a technique consists in using a witness …

This is good, serviceable English, clear, nothing wrong with it. But …

Combining Sentences II

See how the energy level is enhanced when we combine the two sentences and eliminate “such a technique”:

> We use a technique analogous to that described by Toth [24], in which a witness …

Now there is no pause and restart to break the flow of thought. It is continuous, as is the reader’s progress through the text.

Combining Sentences III

Combining sentences is also a way to take advantage of opportunities for parallelism:

> The approaches in the first category assume that spatial structure variations are independent of the color distribution. Thus these two aspects of the same image are measured by different and independent computational methods.

Here, the first sentence is active, the second passive. But …

Combining Sentences IV

If we make the second sentence active, it shares its subject, “the approaches” with the first sentence, and the two can be combined to produce

> The approaches in the first category assume that spatial structure variations are independent of the color distribution and hence use different computational procedures to measure these two aspects of the same image.

This version is both more economical and more dynamic.

Use Pronouns to Avoid Repetition

Another “cure” for slow, repetitious sentences is to replace the repeated noun with a pronoun:

> The relevance of a pixel is calculated as the shortest path between the pixel and pixels that belong to the attractors.

Use Pronouns to Avoid Repetition

Another “cure” for slow, repetitious sentences is to replace the repeated noun with a pronoun:

> The relevance of a pixel is calculated as the shortest path between it and pixels that belong to the attractors.

Use Pronouns to Avoid Repetition

Another “cure” for slow, repetitious sentences is to replace the repeated noun with a pronoun:

> The relevance of a pixel is calculated as the shortest path between it and pixels that belong to the attractors.

> Figure 2 shows the steps for a hierarchical solution. First, the hierarchical solution determines …

Use Pronouns to Avoid Repetition

Another “cure” for slow, repetitious sentences is to replace the repeated noun with a pronoun:

> The relevance of a pixel is calculated as the shortest path between it and pixels that belong to the attractors.

> Figure 2 shows the steps for a hierarchical solution. First, we determine …

Avoid “The former – the latter”

Though neat and economical, this pair of pronouns requires the reader to go back and re-read:

> A measurement consists in coupling a system to a probe and reading the output of the latter to gather information about the former.
>
> Please take care of my cat and my son. The former can stay out all night, while the latter should stay in the house.

Aim for Leaner, More Vigorous Sentences

Even simple phrases can benefit from streamlining:

The generation of electrons is usually promoted by …
Electrons are usually generated by

A refinement of the structure was carried out …
The structure was refined …

The results show that in the quintuplet sample …
In the quintuplet sample

Avoid Pileups of Modifiers

English-speakers, unlike German-speakers, do not stack many modifiers before a noun, especially modifiers that are nouns themselves. Placing some of them after the noun sounds smoother to us, even if it uses more words:

bond-length change electron-phonon mechanisms

electron-phonon mechanisms that change the bond length

a two-electron isotopically enriched ^{13}C nanotube double quantum dot

a two-electron ^{13}C nanotube double quantum dot that has been isotopically enriched

Allow Equations to Be Part of a Sentence

Displayed equations are usually part of the sentence that precedes them. They should not be separated from the sentence by a colon. No punctuation is needed after the following phrases:

is defined by
we rewrite the Hamiltonian as
of the form
Thus
Consider the wave function
we find
where *H* is

Be Sparing with Thus, Therefore, and Hence

These are useful transition words, but because of the pauses associated with them, too many clog up the flow. They also imply that you have no faith in your reader's ability to follow what you are saying.

And Be Sparing with Commas after Them

When you use Thus, Therefore, and Hence, especially as the first word of a sentence, do not follow them with a comma. This is APS style:

Thus PL emissions from the GaAs nanowires …

Exception: If a parenthetic or qualifying remark follows, the need to enclose that remark by commas overrides the no-comma-after-thus rule:

Thus, under these conditions, PL emissions …

Use More Participles

English favors participles ("ing" words) where other languages use infinitives:

Awkward	**Better**
a strategy to describe	a strategy for describing
the probability to find	the probability of finding
inefficient to detect	inefficient at detecting
motivation to study	motivation for studying
concerned to develop	concerned with developing
It is worth to note	It is worth noting
capable to discriminate	capable of discriminating

Use the Right Qualitative Modifiers

Low-high	value, density, weight, intensity, temperature
Small-large	value, difference, variation, gap, overlap
Great	value, variety, interest
Wide	range, variety, gap
Broad	range
Narrow	range, gap
Widespread	use, attention, interest, application

These represent common usage in the scientific literature.
Sorry, there seems to be no rule or pattern involved.

Check for Frequently Misused Terms

Classical

Substitute “classic” in reference to some important piece of work. “Classical” refers to a musical period or to Greco-Roman history.

In Case, In the Case

"In case" is used when referring to some possibility, usually negative:

> Take your umbrella in case it rains.
> In case I don't see you before you leave, have a safe trip.

"In the case" is more appropriate for scientific theory:

> in the case of three variables, Eq. (1) is modified …
> In the first case, we must introduce some constraints …

Informations

There is no plural “informations” (watch your Word program underscore this in red). Information is always singular, even from multiple sources or comprising multiple facts.

Work (your article)

Generally, only non-native speakers use “In this work” to refer to their article. It is not wrong, but native English speakers are more likely to say “we,” “the present article,” “this study,” “ earlier studies,” or “here.”

“Work” in a general sense is fine: “More work is needed to determine …”

Previous, Former

When referring to scientific articles, use “earlier.” Previous implies that only two papers are under consideration—perhaps that the authors have only one other publication. Former is wholly inappropriate, used to describe things that are no longer there, like “my former husband” or that have been replaced, like an outdated view: “It was formerly thought …”

Focus on the Results, Not “the Figure”

Instead of saying

> Figure 5 shows a conductance increase upon exposure to ozone.

make the results the subject of the sentence:

> The conductance increases upon exposure to ozone, as shown in Fig. 5.

Use Appropriate Tenses

The following suggestions for tenses to use in different parts of your paper are not rules, just the most commonly used.

Abstract	Present
Recent background	Present perfect
Your method	Past
Your data, if experimental	Present
Your calculations, if theoretical	Present
Your results	Past
Conclusions	Present perfect, at least for the first sentence

Two Recipes*

1. Recipe for an Abstract

State the question. If readers might wonder why you are asking, devote one or two sentences to background
State what was done
State what was found (only results that answer the question)
State the answer

* Adapted from Mimi Zeiger, *Essentials of Writing Biomedical Research Papers* (McGraw Hill, 1999)

2. Recipe for an Introduction

Start with what is known
Tell a story
Move to the unknown or to a problem with the known
Formulate a question
State your approach
State the answer to the question
Cite references to key work that led to your question
(keep to a minimum)
The importance of the work should be evident, but state
it If necessary.
Keep the Introduction short. Aim to awaken interest.

Before

Before

Before

After