

Revising Technical Manuscripts



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Celia M. Elliott
University of Illinois
cmelliot@illinois.edu



Today we are going to look at techniques to revise and polish technical manuscripts.

Plan for time to reflect and revise

**You should allow as much time for revision as
you did for writing your paper in the first place**

Revising concentrates on three elements

- 1. Clarifying the selection and logical presentation of ideas, tailored to the audience**
- 2. Evaluating the use of language (emphasis, tone, vocabulary)**
- 3. Proofreading for mechanical errors**



Rewriting often takes more time than writing. As you are planning your timeline for completing your paper, build in sufficient time for getting feedback from others and revising the manuscript.

The probability that a first-draft paper, ripped off the printer 30 ns before the deadline, will be acceptable work asymptotically approaches 0.

Revising should proceed in three steps

- 1. Reading for content and logical organization (ideas and structure)**
- 2. Editing for style (language, tone, emphasis, clarity, conciseness)**
- 3. Proofreading for mechanics (formatting, spelling, punctuation, and grammar)**

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Think of the process as zooming in on the manuscript.

Allow sufficient time for each step

It will always take longer than expected

(You heard it here first)

The Elliott editing equations:

$$t = 4h + \varepsilon \quad [1]$$

where t is the time revising actually takes, h is the number of hours you think any idiot ought to be able to do it in, and ε is not necessarily trivial.

$$t = 5(h + a) + \varepsilon \quad [2]$$

Equation 2 is the expression for multi-author papers, where a is the number of authors.

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I have learned that you can talk and talk and talk to physicists, but if you really want to get their attention, show them an equation. Hence the Elliott editing equations given above.

In Eq. 1, t is the time it actually takes to edit a manuscript, h is the number of hours you think any idiot should be able to do it in, and ε is not necessarily trivial.

Equation 2 is the expression for the time it takes to edit a paper that has multiple authors, where t is the time it actually takes, h is the number of hours you think it should take, a is the number of authors, and ε , again, is not necessarily trivial.

1. Look at the science first (macroscopic scale)

Is the information valid, significant, timely, and complete?

Is the context clear? What is new and different? What have you contributed?

Is the information presented at an appropriate level for the audience and the purpose?

Is the narrative arranged in a logical, coherent structure?

Do the main points stand out?

Do figures, equations, and tables support, emphasize, and *clarify* the main points?

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The first pass is from the **macroscopic** (section) level—look at the **science**.

- Are the main points clearly identifiable and given appropriate emphasis?
- Do figures and tables support and enhance the main points?
- Is the narrative coherent—is there a clearly defined progression from background to hypothesis to method to results to conclusions?

TIP: Cut and paste the first sentence of each paragraph into a new document. Read it aloud. Does it adequately tell your story? Are there gaps or omissions?

See <http://people.physics.illinois.edu/Celia/Lectures/Paragraphs.pdf> for tips on how to build effective paragraphs to incorporate an organic, logical structure in your writing.

- Have you supplied sufficient background so that the reader can understand the significance of your work? Have you provided appropriate context through adequate referencing of prior work?
- Have you made your case? Have you justified your assumptions, anticipated reader questions and objections, and supported your arguments?
- Is it clear what you have contributed?

Provide logical transitions

One section ends with:

*“... **Improved sensitivity** is important because amplifiers and signal processors are nonlinear and thus can mix signals that lie outside the desired band; the mixing generates signals with frequencies that appear as in-band noise.”*

Begin the next section with:

*“To **achieve the improved filter performance**, high-quality epitaxial films of YBCO have been...”*

The logical connection between the two sections is made clear by repeating the idea of **improving performance**

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Include summary statements

At the end of each paragraph to lead logically to the next paragraph

At the end of each subsection

At the end of each section

At the end of the paper

TIP: Adding summary statements helps readers follow your logical argument and prompts them to go back and re-read if they don't understand something

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Provide summary statements at the end of each major section of the paper.

The old speaker's rule is "Tell them what you're going to tell them. Tell them. Tell them what you told them." That advice is just as valid for paper and reports. Take it from a mother—telling somebody something important three times is *not* overkill.

Avoid “*abstractitis*”

“writing that is so abstruse that even the *writer* does not know what he or she is trying to say”—*Sir Ernest Gowers, GCB*

“The words ...dance before my eyes in a meaningless procession: cross-reference to cross-reference, exception upon exception—couched in abstract terms that offer no handle to seize hold of—leave in my mind only a confused sense of some vitally important, but successfully concealed, purport, which it is my duty to extract, but which is within my power, if at all, only after the most inordinate expenditure of time.” (*Yale L.J.* 167, 169 [1947]).

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As defined by Ernest Gowers and quoted by Bryan Garner in *Garner’s Modern American Usage*, *abstractitis* is writing that is so abstruse that even the writer does not know what he or she is trying to say.

While Gowers in this case was talking about the U.S. Internal Revenue Code, he could easily have been describing many physics papers.

Gowers’ use of a 68-word sentence is a rant for another day.

How to avoid “*abstractitis*”

1. Clarify—*replace jargon with accessible terminology; use simple subjects and direct action verbs; de-convolute syntax*
2. Quantify—*replace wimpy, qualitative adjectives with quantitative descriptors*
3. Objectify—*give concrete examples; use analogies*

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2. Focus on the “style” (mesoscopic scale)



In this step, we look at the *language*

Avoid gratuitous jargon—who’s your audience?

**Use straightforward, declarative sentences
and keep them short (<25 words)**

**Break up walls of text; one (and only one!)
main idea per paragraph**

Is the *tone* straightforward and objective?

Is the *emphasis* proper and warranted?

Look for ambiguities and redundancies

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Next, zoom in to the **mesoscopic** (intermediate) level—look at the ***words***.

- Is the language clear and unambiguous?
- Have you defined all acronyms and technical jargon that may be unfamiliar to your audience?
- Have you used the simplest word to unambiguously convey your meaning?

Semantics and syntax control clear communication

**“Semantics” is the meaning of words;
you must have a vocabulary adequate to
describe things precisely**



The difference between the right word and the *almost*-right word is the difference between *lightning* and *lightning bug*.
—*Mark Twain*



**Scale your use of jargon to
the intended audience**

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Note that words have connotations (overtones of associated ideas or emotions) beyond their literal dictionary meanings, which also affect the appropriateness of word choice.

Example: dis·place·ment [dis'plāsmənt]

- $\Delta x = x_f - x_o$ (physicist)
- the volume moved by the stroke of a piston (mechanical engineer)
- a geological fault (seismologist)
- the volume of water displaced by a vessel floating in it (marine engineer)
- percolation (pharmacist)
- abnormality in the position or form of a leaf or organ (botanist)
- a defense mechanism in which an emotion is transferred to another, more acceptable object (psychologist)

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Semantics—the indirect relation between words and meaning; note that words have different connotations in different contexts; e.g., “displacement.”

**We will now turn our attention to
a specific subset of semantics in
science writing—the proper use of
four-letter words...**



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This section is **not** about those short, pithy, Anglo-Saxon words we say when we bump our heads or drop something on our feet. It is about the short, pithy, Anglo-Saxon words that cause ambiguity in scientific writing and send Ms. Particular into low-earth orbit.

This

Avoid naked “this”es—they are invariably ambiguous



“In some pellet designs, the average ionic charge, Z , and the laser intensity, I , are large enough that the distribution function is predicted to be non-Maxwellian (flat-topped). **This** has important consequences: reduction of the absorption rate, electron heat flux, and modification of the continuum x-ray emission rates.”

WHAT???

the pellet design, Z , I , the distribution function,
the non-Maxwellian distribution???

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Here's another example:

“Single photons can represent quantum systems of d states (qudits) by occupying d different modes [10–13]. The projection of two such photonic qudits of $d > 2$ onto a maximally entangled state is impossible without the use of auxiliary photons. **This** is because only two particles are involved, while the Schmidt number of the projected state is larger than 2 [30].”

Presumably, this *this* means “everything I said in the previous two sentences.”

Ms. Particular (with the approval of the author)* would revise thus:

“Single photons can represent quantum systems of d states (qudits) by occupying d different modes [10–13]. The projection of two such photonic qudits of $d > 2$ onto a maximally entangled state is impossible without the use of auxiliary photons. Because only two particles are involved, additional photons are required when the Schmidt number of the projected state is larger than 2 [30].”

*The author always trumps the editor. Sad but true.

No more naked “*this*”es—just don’t

A certain amount of energy is required to cause an electron to spin flip when it is beside another electron. Thus, the energy required is double *this* and is provided by the incident photons.



“*This means that...*” → *i.e., or thus*

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With

What does the following sentence *mean*?

“We will investigate *a* with *b*.”

Three different interpretations are possible:

“We will use the *b* method or tool to study *a*.”

“We will carry out some experiments, where *b* will be investigated along with *a*.”

“We will investigate only the subset of *a* having *b* features.”

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Scientists often use “with” as a sloppy substitute for the more precise “having” or “using.”

Using an all-purpose “with” indiscriminately may lead to an ambiguous statement that is difficult for a reader to interpret correctly.

With

Don't use *with* when you mean *having* or *using*

“A single impurity in one-dimensional bosonic systems will be explored, with particular emphasis on accessing a hitherto unobserved phase *with* density-wave correlations.” (???)

Is the author using density-wave correlations as a tool to “access” this new phase, or is the phase characterized by density-wave correlations (unlike other phases, which don't have such correlations)?

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Unless you really mean “along with” or “simultaneously with” or “associated with,” ***don't*** use *with*; use *having* or *using*.

That

Use *that* to define

“Chen et al. [28] have developed a BCS—Bose—Einstein crossover theory of short-coherence-length superconductors *that* exhibit a pseudo-gap, as do BEDT materials.

Use *which* to expand

“The Coffey—Clem theory, *which* generalizes the relation to include thermally assisted flux flow, was tested experimentally.”

What does the following sentence *mean*?

“We have calculated the ground state energy and pairing gap for pure neutron matter in the low-density regime *which* is relevant for the inner crust of neutron stars.”

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That is used to introduce *restrictive* clauses—subordinate clauses that are integral to understanding the meaning of a sentence.

Which is used to introduce *nonrestrictive* clauses—subordinate clauses that introduce additional, interesting, ancillary information that is ***not*** integral to the meaning.

Which clauses are always set off from the rest of the sentence using commas. Think of the commas as handles; they allow you to lift the nonrestrictive clause out of the sentence without changing its meaning.

If you can remove the dependent clause and still have the remaining sentence make sense, the clause is nonrestrictive. Introduce it by *which* and set it off with comma-handles.

If the removal of the clause changes the meaning of the sentence or leaves it senseless, the clause is restrictive and should be introduced with *that* (no commas).

For a more comprehensive discussion of *which* and *that* (you know you want it), see <http://people.physics.illinois.edu/Celia/MsP/WhichisThat.pdf>.

Need

Inanimate objects don't *need* anything

Replace *need* with *must* or *should* or *require*
every time you write it

**“The dial *needs* to (must) be set at “0” prior to
turning on the high-voltage power supply.”**

**“The desired emittance would *need* (require)
approximately seven damping intervals.”**

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Assigning human traits or abilities to animals or inanimate objects is known as anthropomorphism and is considered a flaw in scientific writing.

Here is another example of anthropomorphism:

“The substrate *tells* the YBCO how to align during growth.”

What's going on here is really much more complicated than this simple sentence implies, and good scientific writing should communicate *exactly* what is happening, not some parable that substitutes for the facts.

While such simplification might be acceptable when writing a popular article for a general audience, it has no place in most scientific writing.

Ones

Busy, anonymous *ones* frequently do all sorts of things in stilted technical writing—avoid this trite construction

Recast the sentence in the passive voice to put the emphasis where it belongs

“Knowing the mass, *one* can use the following relation to calculate the radius:

$$m = 4\pi\rho \frac{a^3}{3}.$$

“From the mass, the radius is calculated by ...”

“This report describes the process by which *one* can create still-frame images...”

“A process is described to create still-frame images from data files ...”

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Getting rid of the *ones* should make your writing more concise and direct—always a goal in good writing.

Also

Sentences beginning with a marooned *also* often sound like an afterthought; avoid this construction

Provide a transitional phrase or a simple conjunction (and, but, because) and tie the *also* sentence to the one preceding it

Attach the *also* sentence to the one preceding it with a semi-colon if the ideas are closely related

The dark reaction ($\text{CO} + \text{O}_2$) does not yield any CO_2 on either of the substrates. *Also*, in the presence of UV but the absence of O_2 , no reaction was observed.

The dark reaction ($\text{CO} + \text{O}_2$) did not yield any CO_2 on either of the substrates, and no reaction was observed in the presence of uv light when O_2 was absent.

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In the correction, note that the *UV* in the original is changed to *uv* (AIP Style Manual), and *light* is added to clarify . If *UV* is actually an acronym for something besides *ultraviolet*, more readers than Ms. Particular may be confused.

The verb tense was also changed in the edit so that both clauses were written in the past tense. *Toujours* witless consistency!

“In addition,...” is only marginally better than “Also,...” and will be dealt with accordingly.

From

**Do not use *from* or *between* before a range—
it is meaningless**

**from 2012 to 2015, *not* from 2012–2015
between 11 and 17, *not* between 11–17**

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Data

***Data* is a plural noun and requires a plural verb**

**“The data shows...”
“The data was taken...”** are both wrong

**“The data *show*...”
“The data *were* taken...”**

**The Associated Press now permits journalists
to use *data* as a singular noun, but we have
higher standards in physics**

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If you *really* mean “one data point,” say “one data point.” But beware of basing much of an argument on it.

Very

Avoid this wimpy qualifier*

**Instead, choose a precise word that correctly
conveys the degree**

Wimpy

very small amount

very important

very precise

very rapidly

Precise

less than 15 μg

crucial, essential

$\pm 5 \text{ nm}$; $<10 \text{ ppm}$

simultaneously, in $<2 \mu\text{s}$

***Other wimpy qualifiers: rather, little, pretty (meaning "sort of")**

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What is *very* large to you may be only moderately large to one reader and enormous to somebody else. Don't expect a reader to divine what's in your mind and assign the correct size to a qualitative description.

Take Mark Twain's advice:

"Substitute "damn" every time you're inclined to write "very;" your editor will delete it and the writing will be just as it should be."

Less

***Less* is used for quantities that have been measured or calculated**

***Fewer* is used to describe quantities that have been counted**

“All quantum cryptography schemes to date have a necessary upper limit to the efficiency of the scheme, i.e., (less than/fewer than) 50 percent of the photons sent can contribute to the final key.”

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This example has caused a good deal of angst to Ms. Particular, who could argue either way. (Such contrariness comes as no real surprise to people who know Ms. Particular.)

On one hand, the photons were probably initially counted, which would give the nod to *fewer than*. On the other hand, percentages are calculated, not counted, which would argue for *less than*.

Ms. Particular has a preference for *less than*, because it sounds better.

Lead

***Lead* is a present-tense verb (to lead) or an element (Pb)**

**The past participle of “to lead” is “led”
(not to be confused with LED, a light-emitting diode)**

**“The clues *led* to Colonel Mustard
holding the *lead* pipe in the library.”**

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The “Clue” example will be replaced with a proper physics one in the next edition.

Like

Like means *similar to*

Do not use *like* when you mean *such as* (or e.g.)

“The student will practice each technique on well-known and well-understood materials *like* lead, aluminum, and silver.”

Like excludes; in this example, the student is not practicing on Pb, Al, or Ag, she’s practicing on a well-understood material *similar to* Pb, Al, or Ag

Such as includes

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Most and Best

Some words denote absolute qualities

adequate, best, certain, complete, critical, entire,
equal, essential, favorite, final, finished, perfect,
unique, vital, worst

Do not use most comparative modifiers with absolutes

comparatively, more, most, rather, somewhat, very

Some comparative modifiers that “back off” from the absolute are okay, but use them judiciously

almost, less than, nearly

“more unique” 😞 “almost finished” 😊 “nearly essential” 😊

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Modifiers that emphasize or intensify the absolute (surely, absolutely, completely) are grammatically correct but should be used judiciously.

Modifiers that indicate less than the absolute (almost, nearly, perhaps, not entirely, in some respects, not quite) are correct but wimpy.

Over

Don't use *over* when you mean *compared with*

“When distilled water was used, sample impurities were reduced by 8 percent *over* (compared with) the samples prepared with tap water.”

Don't use *over* when you mean *more than*

“*Over* (More than) half the samples were unusable.”

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And it's ALWAYS “compared with” in science writing.

Fact

A *fact* is undisputed and immutable

Do not use *fact* when you mean

| | | |
|-------------|---------|--------|
| observation | finding | effect |
| phenomenon | result | value |

“The fact that” should be edited out of every sentence in which it occurs¹

| | |
|---------------------------|-----------------------------|
| owing to the fact that | <i>because</i> |
| in spite of the fact that | <i>although or despite</i> |
| unaware of the fact that | <i>clueless²</i> |

¹Strunk and White

²Colloquial and probably ill-advised in science writing (you never know who is going to be reviewing your proposals...)

Science writers should also beware of *factual*, as it has two meanings in English: (1) of or relating to facts, and (2) true.

My analysis might be factual (i.e., an interpretation of facts) and completely erroneous (untrue).

Hope

**Be positive to be persuasive; don't say what
you *hope* to do, say what you *will* do**

**~~"We hope~~ the new frazzlejamber will allow us to
increase the sensitivity of our measurements by
a factor of 2."**

Get rid of hopefully too

***Hopefully*, this work will lead to some new
applications (and make us all a lot of money).**

***hopefully* means "full of hope" or
"in a hopeful manner"; it does *not*
mean "it is to be hoped" or "we hope"**

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In the immortal words of Master Yoda, "Do or do not. There is no try."

And there is no *hope* in science.

Due2

**Should be used as an adverbial phrase following
a *to be* verb**

**Other uses blur the distinction between *caused
by, because of, owing to, and associated with,*
which have distinct but subtle gradations in
the degree of causality**

**If you cannot substitute *attributable to*,
replace *due to***

**If *due to* is used to begin a sentence,
it is probably wrong as well as inelegant**

**Writing “due to the fact that” is an
egregious abuse of readers’ sensibilities**

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Editors have a deep and abiding aversion to *due to*. Scientists should too, because it’s sloppy.

Another due2 example...

“Previous work has shown that tips made from softer magnets, such as nickel or cobalt, significantly enhance spin relaxation rates *due to* thermal fluctuations of the magnetic moment.”

What’s meant here?

Do the softer magnets affect only *some* spin relaxation rates (only those caused by thermal fluctuations)?

Or are the thermal fluctuations (a feature of the softer magnets) the cause of the enhanced spin relaxation rates?

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Careless writers often use *due to* as a shorthand to compress complex causal relationships into one easy six-character phrase. Avoid this temptation.

“Syntax” is how words are ordered

English has five basic syntax rules:

- 1. A sentence must have a subject & a verb**
- 2. A sentence should express one main idea**
- 3. “Normal” syntax: subject → verb → object**
- 4. An object can be “direct” (answers *what* or *whom*) or “indirect” (answers *for what* or *to whom*)**
- 5. Adjectives and adverbs precede the words they describe or limit**

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Of course, English has many more “rules” than these five, and about as many exceptions as rules. But adhering to these rules will go a long way toward your goal of clear, unambiguous communication.

**Careless syntax can change the
meaning of a sentence**



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Look out for misplaced modifiers (syntax is critical)

Several methods were used to produce the thin metal substrates—hot stamping, cold rolling, and cleaving.

*“Hot stamping, cold rolling, and cleaving” are methods, not types of *substrates*.*

Rewrite as:

Several methods—hot stamping, cold rolling, and cleaving—were used to produce the thin metal substrates.

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One way to avoid sloppy syntax is to write shorter sentences and control your modifiers. We’ll see how and why in a minute...

“Only” is the most commonly misplaced modifier in English

“Only” immediately preceding a verb is usually in the wrong place

Here’s a simple declarative sentence:

“He said that he loved me.”

We can all agree on what the sentence means.

Now look what happens when we randomly perturb the sentence with “only”...

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Only is a limiter, and usually what is being limited is some condition, ***not*** the action of the verb.

“He said that he loved me.”

Only he said that he loved me.

Everybody else stood around and looked awkward.

He **only** said that he loved me.

He didn't really mean it; he only said it.

He said **only** that he loved me.

He didn't say a word about marriage.

He said that **only** he loved me.

He doesn't know about Serge.

He said that he **only** loved me.

He doesn't respect me.

He said that he loved **only** me.

He thinks I don't know about Clarice.

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Here's a science example:

"A transition only occurred at 130 K in underdoped samples."

Did the transition only *occur* (it didn't persist)?

Or did it occur only at 130 K?

Or only in the underdoped samples?

Only the author knows...

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“Only” immediately preceding a verb is probably in the wrong place

- ☹️ “Thus a single phase slip center *only* occurs at $I=I_c$, and its dissipative size is $\lambda_Q \geq L$.”
- ☹️ “The occupied electronic states *only* show features associated with the carbon lattice of the SWNT cage.”
- 😊 “At last, we will be able to directly probe the TeV energy scale, where it is believed that some new physics should be lurking, although we can *only* speculate about what form it will take.”

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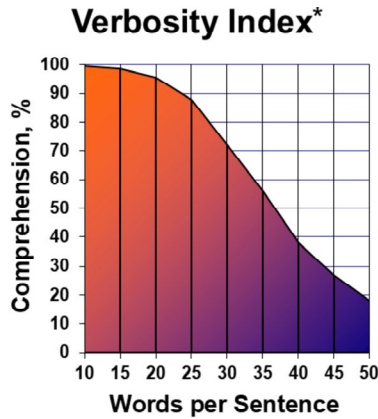
But it's not only verbs you have to watch out for

- ☹️ “Extensive shielding ensured that **only** scattering from the marked regions was detected.”
- ☹️ “Usually, the analytical evaluation of $J(X_p, t; X_p, 0)$, even for time-independent systems, is **only** possible in very few cases.”

**Be careful of your “only”s—
they can get you into a lot of trouble!**

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Use these techniques to revise for clarity and conciseness



***Illustration only, does not represent actual data.
(But it could.)**

Write shorter sentences

Limit the number of modifying clauses & prepositional phrases

Keep verbs close to subjects

Express ideas in positives, not negatives

Avoid indirect constructions; put the subject first

Eliminate unnecessary words

De-nounify verbs

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We'll look at how to apply each of these editing techniques next.

Write shorter sentences (<25 words)

The following sentence (63 words), while grammatically correct, is impossible to understand on the first reading



“A program of chemical analysis and receptor modeling is proposed in which samples obtained at the EB ENTEK sites will be used to estimate the sources and/or source regions of trace elemental deposition into the area and the effects of specific urban areas on the airborne particulate matter compositions and thus, their potential contribution to the contamination of the area’s water supplies.”

Avoid long strings of nouns used as adjectives, too
mean field anisotropic superconducting reverse bias
toroid magnet <sigh>

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Write short sentences—fewer than 25 words.

Avoid long strings of nouns used as adjectives—“mean field anisotropic superconducting reverse bias toroid magnet” (or MASRBTM, to its fans)

Observe the “three-preposition” rule.* If you have a sentence that contains more than three prepositional phrases, rewrite it before it wanders off to die.

Writing shorter paragraphs will also help your reader follow the logic of your narrative. For more information on how to write strong paragraphs, see

<http://people.physics.illinois.edu/Celia/Lectures/Paragraphs.pdf>.

*With thanks to Stephanie Teich-McGoldrick of Sandia National Laboratories, who first introduced me to the three-preposition rule.

Keep **verbs** close to their **subjects**

Several schemes ranging from minimal computational cost and poor accuracy to high computational cost and high accuracy **can be employed**.

*Several schemes **can be employed**, ranging from minimal computational cost and poor accuracy to high computational cost and great accuracy.*

A program to be used in conjunction with a PC data acquisition card **was written**.

*A program **was written** for ~~use with~~ a PC data acquisition card.*

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One of the pitfalls of using the passive voice is the tendency by amateurs to maroon the verb at the end of the sentence. Avoid this practice.

**Recast *negative expressions*—
a positive is easier to understand
and is usually more concise**

**Although some data supported the hypothesis, it
could not be concluded that output scaled linearly
with current.**

Output appeared to scale nonlinearly with current.

**Arcing under high-current operation could not be
avoided without the use of the insulated feedthrough.**

***The insulated feedthrough prevented arcing,
even during high-current operation.***

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Ideas expressed as positives are almost always easier to process and grasp quickly. Readers must undergo a second step of deciphering ideas presented as negatives; they have to backtrack to figure out what something *is*, if you tell them what it is *not*. Don't make your readers work this hard.

Avoid beginning clauses with “There are...” or “It is...” —put the subject first and plunge right in

“Aside from the point defect corresponding to the cone’s vertex, there is a ‘focal’ set consisting of the two parabolic segments $x^2 = b|y| + b^2/4$.”

“In addition to the point defect corresponding to the cone’s vertex, a ‘focal’ set occurs that consists of the two parabolic segments $x^2 = b|y| + b^2/4$.”

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Train yourself to spot “It is...” and “There are...” sentences and rewrite them in the passive voice, which puts the important point first in the sentence (“front loads”).

Make sure *pronouns* refer to the correct antecedent

Non-commutative geometry is obtained when the latter equation fails and is replaced by another equation, as in the case of the quantum Hall system. The interpretation of this effect in superstrings is startling, however, because *it* is a fundamental theory of spacetime, and *it* means that we cannot think of spacetime in terms of ordinary smooth geometry, as in general relativity.

or *any* antecedent...



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Ideally, a pronoun should refer to the noun immediately preceding it. Don't make the reader go back several sentences to determine what "it" you mean. By the same token, you may not use a pronoun until you have first used the noun to which the pronoun refers.

Avoid the big A's—amphibologies and anthropomorphism

Beware of words with multiple meanings

A sintered mixture for the experimental heating rod was prepared from martensitic steel and 5% nickel. *This element* proved to be unsatisfactory.

A subtle but important *point* about the series of *points* generated is that they are not statistically independent *points*.

Don't give human traits to inanimate objects

The substrate *tells* the YBCO how to align during growth.

The dial *needs* to be set at ...

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The dial doesn't care...

Be sure to use the right word

Alternate or alternative?

Ability or capacity?

Affect or effect?

Principle or principal?

Optimal or optimum?

Biannual or biennial?

Compliment or complement?

Bryan A. Garner, *Garner's Modern American Usage*
(New York, Oxford University Press, 2003)

Theodore Bernstein, *The Careful Writer*
(New York, Atheneum, 1965)



Ms. Particular's Micro-Lectures on Style and Usage
(<http://people.physics.illinois.edu/Celia/MsP/MsParticular.htm>)⁴⁹

Change nouns ending in *-tion*, *-ment*, and *-ance* back into verbs

The most common use for Raman spectroscopy is for the observation of phonons. (13 words)

*Raman spectroscopy is most commonly used to **observe** phonons.* (9 words)

We proceeded to make an arrangement of the superconducting islands on the substrate with the STM tip. (17 words)

*We **arranged** the superconducting islands on the substrate using the STM tip.* (12 words)

*The superconducting islands **were arranged** on the substrate using the STM tip.* (Better?)

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Many English words derived from Latin change verbs into the nominative form by adding *-tion*, *-ment*, and *-ance* suffixes to the verbs. Thus *act* (v.) becomes *action* (n.), *arrange* (v.) becomes *arrangement* (n.), and *perform* (v.) becomes *performance*.

An easy way to improve the conciseness and vigor of your writing is to be on the alert for these nouns and change them back into the verbs they came from.

3. Now for proofreading (microscopic scale)



Editing concentrates on ideas and expression

Proofing concentrates on mechanics

The importance of *proofreading* cannot be overstated

VOLUME 76, NUMBER 17

PHYSICAL REVIEW LETTERS

22 APRIL 1996

**Effect of Filamentation of Brillouin Scattering in Large Underdense Plasmas Irradiated
by Incoherent Laser Light
[Phys. Rev. Lett. 75, 4413 (1995)]**

T. Afshar-rad, L. A. Gizzi, M. Desselberger, and O. Willi

We regret that in the printed version of the manuscript, Figs. 2(a)–2(c) were interchanged with Figs. 3(a)–3(c). In addition, the published Fig. 3(d) was incorrect. As the principal conclusion of the article was based upon a comparison of Figs. 2(a) and 2(b) to Figs. 3(a) and 3(b), this error may have prevented many readers from comprehending the Letter. We are therefore reprinting it correctly below.

You do not want to be these authors. Believe me.

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Proofreading examines the manuscript one word at a time



Acronyms, mathematical symbols, and special characters are defined at first usage

Format and typography are consistent and conform to manuscript preparation rules

Technical writing conventions are observed

Grammar and usage are flawless

Punctuation and spelling are *perfect*

TIP 1: Always proofread from a hard copy

TIP 2: Start at the bottom right-hand corner and read backwards and up

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Maintain witless consistency throughout the text

**Terminology—always call the same things by
the same names**

Typography—use of italics and boldface

Expression of numbers

Definitions of symbols or special characters

Legends in figures

Style of subheadings, captions, table titles

Use of color



People expect differences to *mean* something!

53

If you talk for four pages about a “solar collector” and suddenly introduce a “solar absorber” on Page 5, a careful reader will wonder if something qualitatively different is being described.

Present a professional-looking document

Select an appropriate font and size

Use no more than two font styles

**Automatically hyphenate the document to
avoid annoying white spaces in
fully justified lines**

**Position graphics strategically, and after they
are discussed in the text**

Select an attractive page layout

Adequate white space

Clean, uncluttered appearance

54

To recap:

Assess important ideas,
logical structure,
precise language,
“mechanical errors”
—in this order



Focus on semantics and syntax—simplest
word and most direct sentence structure

Eliminate digressions and redundancies

Pay attention to transitions and reader cues

Proofread from a hard copy

Allow enough time!



cmelliot@illinois.edu

<http://physics.illinois.edu/people/Celia/>

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Notes: