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

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

GCB = British honorary title, Knight Grand Cross.
How to avoid “abstractitis”

1. **Clarify**—replace jargon with terms that are understandable and meaningful to your audience; use simple subjects and action verbs; de-convolute syntax

2. **Quantify**—replace wimpy, qualitative adjectives with quantitative descriptors

3. **Objectify**—give concrete examples; use analogies
Because we think in words, the act of expressing observation in language—of distilling amorphous thoughts into words—is a powerful tool for clarifying your thinking.

Translating your thoughts into words so that you can communicate them to someone else forces you
to question your assumptions.
to look for holes.
to fill in gaps in your thinking.

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. Confirming the content and logical organization (ideas)
2. Editing for style (language, tone, emphasis)
3. Proofreading for mechanics (spelling, punctuation, and grammar)

Allow sufficient time for each step!
(it will always take longer than expected)

The Elliott editing equations:

\[ t = 3h + \varepsilon \] [1]
\[ t = 5(h + a) + \varepsilon \] [2]

Think of the process as zooming in on the manuscript.

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 \( \varepsilon \) 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 \( \varepsilon \), 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 figures, equations, and tables support, emphasize, and clarify the main points?

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?
• 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?
**TIP: Get an overview of the whole paper**

Cut and paste the first sentence of every paragraph into a new document

Read the new document aloud

Does it have a clear logical structure?

Is the context clear?

Does it have gaps or unexplained assumptions?

Are the conclusions supported by the evidence?

Does it have redundancies or extraneous information?
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

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

*Building Good Paragraphs: http://people.physics.illinois.edu/Celia/Lectures/Paragraphs.pdf

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 if from a mother—telling somebody something important three times is not overkill.
Now for a poll question...
How much time should you allow for revising a technical manuscript?

A. 1 hour per page
B. Depends on how technical the text is
C. At least 3× longer than you think it will take
D. Doesn’t matter—you’ll have to revise it again when you get the reviewers’ comments
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*Your mileage may differ, but plan for plenty of time to reflect.
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?
Write short sentences—fewer than 25 words.

Unlike highly inflected languages, in English we spell nouns the same way, whether they are the subject of a sentence, the object of a verb, or the object of a preposition. We spell some words the same way, whether they are being used as a noun, and adjective, or a verb. (“The time clock had a very distinctive clock face and clocked the runner at 48 s.”) The only way we can understand the relationship of words in a sentence in English is by the syntax, i.e., the order of the words. If you string together more than about 25 to 30 words in English, it’s just too hard to decipher how they all relate to one another.
**Observe the three-preposition rule**

No sentence shall contain more than three prepositional phrases.

*A pollution problem with diesel engines has historically been their tendency to produce soot and smoke, but oxygen in the methyl ester group leads to lower soot emissions from diesel engines when using biodiesel fuel.*

Here’s how to fix this unwieldy sentence:

*Air-polluting soot and smoke are produced by diesel engines that burn petroleum fuels. The use of biodiesel fuel, which contains oxygen in the methyl ester group, reduces soot emissions.*

Sometimes you just have to start over.—cme

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

Ideas expressed as positives are almost always easier to process and grasp quickly. Readers have to 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 that hard.
Avoid beginning clauses with “There are...” or “It is...—put the subject first and plunge right in

There is clearly a need for an observable sensitive to changes in the nuclear shape and common to all isotopes.

An observable is clearly needed that is sensitive to changes in the nuclear shape and common to all isotopes.

Train yourself to spot “There is...” and “There are...” sentences and rewrite them in the passive voice, which puts the important point first in the sentence (“front loads”).
Another poll question...
What is the easiest way to improve the clarity of your writing?

A. Use very technical jargon for accuracy
B. Write shorter sentences
C. Don’t just say what something is; also say what it is not to avoid ambiguity
D. Include a lot of qualifying phrases
Another poll question...
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Eliminate *unnecessary* words

the results *tend to* suggest
they are *both* identical
*estimated to be* about 0.75 mg
such as copper, iron, and *etc.*
bright yellow *in color* and elliptical *in shape*
\[ \Lambda = \lambda/2\theta, \text{ and vice versa} \]
given *the fact that* \[ \tau_a = \sigma q_s \int n(s) ds \]
were reexamined *in order* to confirm the presence
*It is known that* nanocrystallites can form shear bands

“A phrase such as “*it is interesting to note that*”
adds no information and only delays getting to
the point of the sentence.” *Scientific Style and Format*
Replace *wordy expressions*

due to the fact that
in the near future
a very limited number of cases
it appears to be indicated that
in spite of the fact that
subsequent to
at the present time
in consequence of this fact
as compared with
in combination with

because
soon
few
apparently
although, despite
after
now
thus
versus
with
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)

Revising concentrates on the ideas

Editing concentrates on language and style

Proofing concentrates on mechanics

The importance of proofreading cannot be overstated—so-called careless errors (spelling, punctuation, grammar) will make readers wonder about how carefully you did the experiment itself and question your attention to detail.
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 spelling are flawless

TIP 1: Proofread from a hard copy

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

TIP 3: Proofread everything

Don’t proofread only the narrative text. Proofread everything—the headings and subheadings, the running title, figure labels and captions, table titles and column headings, the acknowledgments section...
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.
To recap:

Focus on important ideas, logical structure, precise, understandable language, “mechanical errors” — in this order

Clarify—quantify—objectify

Eliminate redundancies and wordy expressions

Proofread from a hard copy

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Notes: