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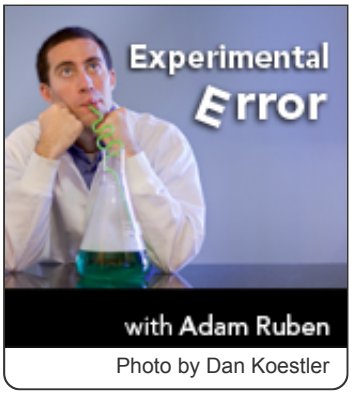


Photo by Dan Koestler

Life & Career

How to Write Like a Scientist

I didn't know whether to take my Ph.D. adviser's remark as a compliment. "You don't write like a scientist," he said, handing me back the progress report for a grant that I had written for him. In my dream world, tears would have come to his eyes, and he would have squealed, "You write like a *poet*!"

In reality, though, he just frowned. He had meant it as a criticism. I don't write like a scientist, and apparently that's bad.

Using the first person in your writing humanizes your work. If possible, therefore, you should avoid using the first person in your writing.

I asked for an example, and he pointed to a sentence on the first page. "See that word?" he said. "Right there. That is not science."

The word was "lone," as in "PvPlm is the lone plasmepsin in the food vacuole of *Plasmodium vivax*." It was a filthy word. A non-scientific word. A flowery word, a lyrical word, a word worthy of -- ugh -- an MFA student.

I hadn't meant the word to be poetic. I had just used the word "only" five or six times, and I didn't want to use it again. But in his mind, "lone" must have conjured images of PvPlm perched on a cliff's edge, staring into the empty chasm, weeping gently for its aspartic protease companions. Oh, the good times they shared. Afternoons spent cleaving scissile bonds. Lazy mornings decomposing foreign proteins into their constituent amino acids at a nice, acidic pH. Alas, lone plasmepsin, those days are gone.

So I changed the word to "only." And it hurt. Not because "lone" was some beautiful turn of phrase but because of the lesson I had learned: Any word beyond the expected set -- even a word as tame and innocuous as "lone" -- apparently doesn't belong in science.

I'm still fairly new at this science thing. I'm less than 4 years beyond the dark days of grad school and the adviser who wouldn't tolerate "lone." So forgive my naïveté when I ask: Why the hell not?

Why *can't* we write like other people write? Why *can't* we tell our science in interesting, dynamic stories? Why must we write dryly? (Or, to rephrase that last sentence in the passive voice, as seems to be the scientific fashion, why must dryness be written by us?)

I once taught two different college science writing classes in back-to-back semesters. The first was mainstream science writing; the students had fun finding interesting research projects and writing about them. One student visited a lab where scientists who were building a new submarine steering mechanism let her practice steering a model sub around a little tank. Another subjected himself to an fMRI and wrote about the experience.

But the second semester was science writing for scientists, in which they learned how to write scientific journal articles -- and it was a lot less fun. "Keep it interesting!" I told my students during the first semester. To my second-semester students, I said, "Well, you're not really supposed to keep it interesting."

We're taught that scientific journal articles are just plain different from all other writing. They're not written in English per se; they're written in a minimalist English intended merely to convey numbers and graphs. As such, they have their own rules. For example:

1. Scientific papers must begin with an obligatory nod to their own relevance, usually by citing exaggerated figures about disease prevalence or other impending disasters. If your research does not actually address one of these issues, pretend it does, because hey, that didn't stop you on the grant application. For example, you might write, "Twenty million children die of scabies every day. OMG we built a robot kangaroo!"

2. Using the first person in your writing humanizes your work. If possible, therefore, you should avoid using the first person in your writing. Science succeeds in spite of human beings, not because of us, so you want to make it look like your results magically discovered themselves.

3. Some journals, such as *Science*, officially eschew the passive voice. Others print only the passive voice. So find a healthy compromise by writing in *semi*-passive voice.

ACTIVE VOICE: We did this experiment.

PASSIVE VOICE: This experiment was done by us.

SEMI-PASSIVE VOICE: Done by us, this experiment was.

Yes, for the semi-passive voice, you'll want to emulate Yoda. Yoda, you'll want to emulate.

4. The more references you include, the more scholarly your reader will assume you are. Thus, if you write a sentence like, "Much work has been done in this field," you should plan to spend the next 9 hours tracking down papers so that your article ultimately reads, "Much work has been done in this field[1,3,6-27,29-50,58,61,62-65,78-315,952-Avogadro's Number]." If you ever write a review article, EndNote might explode.

5. Grammar textbooks contain elaborate rules about when to use numerals and when to write out numbers. But numbers are really the only reason you're writing your paper, and you don't want readers to think you're into something as lame as *words*. So make sure every single number is written in its numeral form -- otherwise, 1 day, you'll awake 2 find that you're 4got10.

6. Most journals use the past tense. To add flair to your writing, try writing your entire article in the Third Conditional Progressive Interrogative tense. Instead of, "We did this experiment," you'd write, "Would we have been doing this experiment?" This may seem more convoluted than simple writing, but your article probably won't be any less comprehensible than most other scientific journal articles.

7. Always write "we" instead of "I," even if you performed the research yourself; the plural ensures that no feelings will be hurt when credit is attributed. For example, "We investigated these results, but then we had to use the bathroom, which is where we sat when our spouse called."

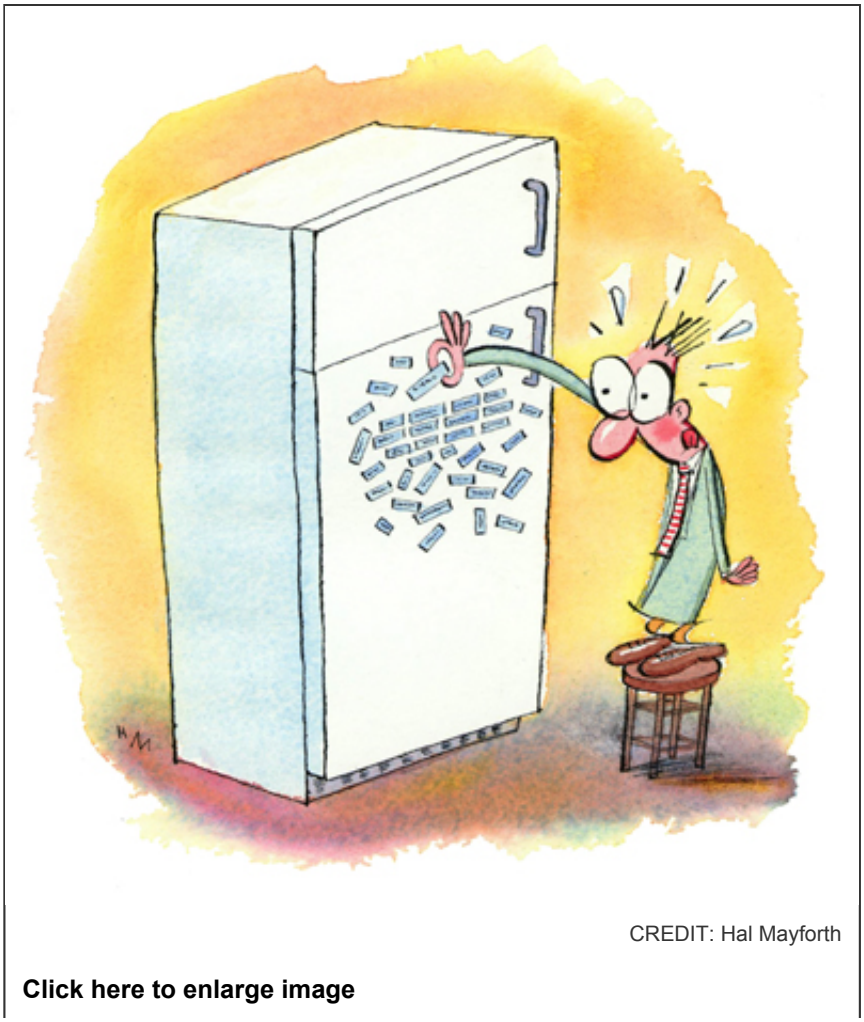
8. Remember your audience. It consists primarily of graduate students who, 10 years from now, will include your paper in their own voluminous collection of superscripted references. So remember them, and make your name easy to spell.

9. Starting sentences with "obviously" or "as everyone knows" demonstrates your intellectual superiority. If possible, start sentences with, "As super-intelligent beings like myself know," or "Screw your stupidity; here's a fact-bomb for you."

10. Your paper will be peer reviewed, so include flattering descriptions of all of your peers. Scientists call these "shout-outs" or "mad props."

11. Too many results are reported using SI units. (For those unaware, "SI" stands for "*Sports Illustrated*," and it is a system of measurement using units like RBI, Y/A, and, once a year, cup sizes.) Liven up your results by reporting them in furlongs, chaldrons, and fluid scruples.

12. If you're co-authoring a paper, most of your notoriety will derive from the order of authors and not



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from the content of your paper -- so make sure to have vehement and petty debates about whose name goes first. Here are the general rules for authorship:

(http://sciencecareers.sciencemag.org/get-file.xqy?uri=/aaas/files/uploaded-files/images/eefbae26-9ccb-4182-859b-5d2a5c0c17c7/science_fridge_800x842.jpg)

FIRST AUTHOR: Weary graduate student who spent hours doing the work.

SECOND AUTHOR: Resentful graduate student who *thinks* he or she spent hours doing the work.

THIRD AUTHOR: Undergraduate just happy to be named.

FOURTH AUTHOR: Collaborator no one has ever met whose name is only included for political reasons.

FIFTH AUTHOR: Postdoctoral fellow who once made a chance remark on the subject.

SIXTH AUTHOR: For some reason, Vladimir Putin.

LAST AUTHOR: Principal investigator whose grant funded the project but who hasn't stood at a lab bench in decades, except for that one weird photo shoot for some kind of pamphlet, and even then it was obvious that he or she didn't know where to find basic things.

Many scientists see writing as a means to an end, the packing peanuts necessary to cushion the data they want to disperse to the world. They hate crafting sentences as much as they hate, say, metaphors about packing peanuts.

But there's a reason scientific journal articles tend to be dry, and it's because we're writing them that way. We hope that the data constitutes an interesting story all by itself, but we all know it usually doesn't. It needs us, the people who understand its depth and charm, to frame it and explain it in interesting ways.

This is, in fact, one of the most appealing aspects of science: We're more than just the people who push the pipette buttons. We're advocates who get to construct and tell the stories about our science. I can't think of a better lone career.

Adam Ruben, Ph.D., is a practicing scientist and the author of ***Surviving Your Stupid, Stupid Decision to Go to Grad School. (http://www.amazon.com/Surviving-Your-Stupid-Decision-School/dp/0307589447)***

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