

A Nontrivial Manifesto

Matt Landreman

Dan got strange looks on his first visit to a bar in Minneapolis. My English friend, on his maiden voyage to the States, had stumbled upon one of those little linguistic divergences between the colonies and the mother country. What Americans refer to euphemistically as a “bathroom,” Britons unabashedly describe by the direct “toilet,” and Dan had asked some Yanks for directions to the latter. A first encounter with this difference of dialect can be startling to our naïve American ears. Words that seem natural to one person can have an unintended effect on the uninitiated. One instance of this same problem among physicists is far less benign than Dan’s mishap; it causes unnecessary frustration and impels bright students to leave our field: our flippant description of just about anything as “easy,” “simple,” or “obvious.” And then, there is the T-word.

Flip through an average textbook or article, and you are likely to come across one of these insinuating taunts: “*Obviously . . .*,” “After some *simple* algebra . . .,” “An *easy* derivation shows . . .,” “It *should be clear* that” A student reading the book for the first time may not find the derivation in question nearly so clear as the subtext: “If you don’t understand this immediately, your ineptitude for physics must surely exceed that of a rutabaga.” However, no word in the physicist’s vocabulary exudes more contempt and scorn than the obnoxious “trivial.” We use this word with reckless abandon: “The proof is trivial.” “Trivial algebra yields . . .” “I assigned just a few trivial problems this week.” No other word better exemplifies how the jargon of our trade can be so condescending. I will grant that unlike the other terms I have just indicted, “trivial” can have a technical mathematical meaning: the uninteresting solution to a differential, matrix, or other equation. However, most of the times we invoke this word, we have no such excuse, and even in

those technical contexts we can come across as pompous.

Others before me have pointed out the pitfalls of this parlance. Richard Feynman wryly observed, “Mathematicians can prove only trivial theorems, because every theorem that is proved is trivial.” The offending words have even inspired a tired genre of conversation among us students, as when a friend in my research group recently observed, “If you are a professor and you don’t know how to work out the algebra, you just say ‘it’s trivial’ and the class won’t ask you about it.”

There is an irony, though, in our adoption and usage of the word. My predecessors here at Oxford, from the university’s beginnings until around 1550, spent their first year among these dreaming spires studying the “trivium.” That course consisted of the easiest three subjects (in their minds) of the liberal arts—rhetoric, logic, and grammar—and our present word “trivial” was derived from its name. After completion of the trivium, medieval pupils graduated to the more challenging “quadrivium” of music, astronomy, geometry, and arithmetic. How funny that it is this last discipline that we now love to mock with the T-word. In 1500, arithmetic was the very definition of nontrivial.

Not needed and counterproductive

We could use one of those Renaissance lessons in rhetoric today. Every word we use should serve a purpose. What is achieved by saying that some particular integral or other bit of algebraic gymnastics is easy? We add nothing productive by using this overworked locution and its cousins; if a problem is so obvious, why assign it at all? And maybe the mathematics is easy for someone who has written the homework question, someone who has been in the field for years, someone who just prepared lecture notes on the material. But is there any pedagogic gain in saying that the step seems so straightforward to you? Such a statement will certainly not make the student feel more confident in his or her abilities. For the pupil, it is a lose–lose situation: Either the student does see

the solution and it was easy anyway, or else he or she was blind to something that should be obvious. Our vocabulary creates a pressure to perform that need not exist. The aim of teaching, after all, is to efficiently transfer years of accumulated intuition into a new mind, one that sees very different things in the same symbols on the same paper. Use of the words “simple” and “trivial” betrays an insensitivity to this challenge of communication. These words make the student less receptive to the content and impede the flow of knowledge.

Pointless pressure

By being inconsiderate in this way we misrepresent ourselves. We physicists in many other ways do display an estimable warmth and inclusiveness. We do a better job than many professions at welcoming collaboration and treating substance over surface. Of the many physicists I hear using “trivial” and other words of its ilk, I sincerely believe that almost none intend to be condescending. We do not mean to say, “If you don’t understand this step right this second then you are not cut out to be in this course.” The best of us fall into the trap of using “easy” and “obvious” just because we hear them so often. Over the years we grow inured to the psychological stress they put on the listener.

Another consequence of our unfortunate verbiage is that we risk losing our best members to another field—or worse. Ours is a hard business; it is natural for a physicist to be self-conscious about his or her abilities, and we should not compound such doubts with cocky modifiers. Paul Ehrenfest and Ludwig Boltzmann both committed suicide, each thinking himself a failure at physics. I, too, often question whether I am competent to pursue the field. While I will not put the blame for this doubt entirely on the accused words, their use has certainly helped create the uncomfortable atmosphere in our trade that has fueled my anxieties. And the three of us are not alone in our insecurity: One study of female physics undergraduates found that, “rather than becoming more confident

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in their abilities as they make their way through college, the proportion of women reporting lack of self-confidence nearly doubles by the senior year" to 44.5%, from an already significant 23.0% of first-year female students.¹ Also, 28.4% of the students report "feeling intimidated." The study found that many highly competent women switch to a different major for the reasons I just mentioned. The undesirable effects of our overconfident airs on the representation of women and minority groups in physics has also been discussed in J. Murray Gibson's Opinion piece in PHYSICS TODAY (February 2003, page 54). We undertake study after study of how to keep the brightest students, especially women and members of other underrepresented groups, from leaving for greener pastures along the way to a PhD (see the article by Barbara L. Whitten, Suzanne R. Foster, and Margaret L. Duncombe, PHYSICS TODAY, September 2003, page 46). How much of that efflux is due to their wisdom—the sensible choice to get out of a field where they are incessantly bombarded with adverbs and adjectives that question their competence?

A call to arms!

Resolve to excise these terms from your physics vocabulary today. Do a quick search before you send off that manuscript you have been writing and cut out every appearance of "simple." In your next lecture, tell your class that equation 2.3 follows 2.2 by "algebraic" steps, not "obvious" ones. When we do discuss the uninteresting $x = 0$ solution to an equation, I propose we start calling it the "zero solution" or "constant solution" instead of the trivial one. Post this article on your office door and share it with your colleagues. With diligence and determination, our community may hope to wean itself from these snide expressions in a few years' time. Really, for what percentage of the people on Earth is even integrating $\sin(x)$ a trivial matter?

Reference

1. S. G. Brainard, L. Carlin, in M. Lederman, I. Bartsh, eds., *The Gender and Science Reader*, Routledge, New York (2001), p. 31. ■

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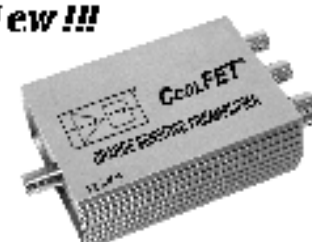
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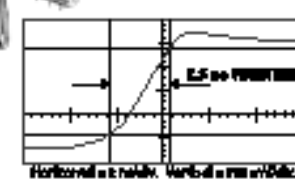
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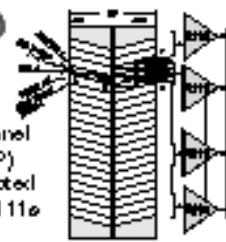



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