Alternatives to "good" in technical writing

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This note is part of an ongoing series intended to ensure that readers focus on your research rather than on phrases that may not sound natural in English. Every reviewer has a threshold for encountering awkward wording; if this criterion is exceeded, reviewers tend to shift their focus to language differences and may even refuse to finish reading the manuscript. My goal is to suggest more natural phrases and strategies for communication to keep the focus on your high-quality study.

Precision is a crucial element of high-quality academic writing. In the academic literature, authors too often use the vague adjective "good" to describe the results of an analysis, the features of a device, or the performance of a technique. Unfortunately for the reader, "good" is nearly useless as a description. Does "good" mean simply "acceptable" (which is not so good), or does it mean "exceptional" (which is very good)? Does it mean "adequate" (in terms of being minimally sufficient)? Or "well-suited" (for a particularly environment or set of conditions)? Or "favorable" (in benefiting the outcome of our research)? Or "outstanding" (above other examples in its class)? Our readers seek our expert interpretation of hard-won data, but "good" doesn't give them much to go on.

Word limits and the short attention spans of readers mean that every word of our paper counts. This condition is especially true for the abstract and the conclusions, those most valuable sections that present the broad implications of our work. In these shorter sections, little surrounding context exists for readers to interpret our message, and "good" can sound particularly awkward or dull. Even deep in the supplementary information, however, it always benefits us to replace "good" with a more precise word that better conveys the intended meaning. **So let's survey alternatives to "good" that will shift the precision of our descriptions from "good" toward "outstanding."**

The first question we might ask is whether "good" can be replaced with the exact property of interest. The literature is filled with, for example, papers describing materials with "good mechanical properties" when the authors actually mean "large tensile strength," "low shear modulus," "high fracture toughness," "resistance to fatigue," "low susceptibility to creep," "strong corrosion resistance," "minimal surface roughness," "undetectable hysteresivity," "negligible chronic inflammation results following implantation," or another precise reference to a well-defined characteristic. Even "good ductility" isn't "good" enough; the requirements of different forming processes might necessitate a high or a low ductility, for example. Instead, let's articulate to the reader exactly what we mean.

> **Vague:** "In this study, we aimed to develop freestanding cellulose membranes with good mechanical properties."

> **Better:** "In this study, we aimed to develop freestanding cellulose membranes with a **high burst pressure** and a **low dissolution rate in acidic aqueous environments**." (Later, we'll specify exactly what we mean by these features, e.g., a burst pressure of 10 atm gauge.)

In some cases, we may be referring to a process that is **convenient** or **efficient**, i.e., one that uses relatively few resources to achieve a goal:

> "…provide a **convenient** starting point to describe NC surface ligands." Boles et al., *Nature Materials* 15, 141–153 (2016).

> "For **efficient** light-to-heat conversion from a wider solar spectrum…" Bae et al., *Nature Communications* 6, 10103 (2015).

In other cases, a device or procedure may be **consistent** or **reliable**, i.e., largely free from the possibility of errors:

> "…to ensure **consistent** operation at programmed time points, this protocol adopts…" McCall et al., *Nature Protocols* 12 2 (2017).

> "…the development of **reliable** surveillance and risk assessment procedures…" Berendonk et al., *Nature Reviews* 13, 310–317 (2015).

(Alternatively, we might describe a technique associated with small errors as **precise** or **accurate**.)

Consistent can also refer to results that corroborate other results or agree with theoretical predictions:

> "GST and QPT yield **consistent** results, with process fidelities of ≥86% for all gates." Kim et al., *Nature Nanotechnology* 10, 243–247 (2015).

(Alternatively, we might describe a process that can be performed repeatedly with consistent results as **reproducible** or **replicable**.)

Straightforward is appropriate when describing a process or analysis that can be completed with few complications or uncertainties:

> "…a low solvent content crystal of 35% still allowed **straightforward** structure solution…" Weinert et al., *Nature Methods* 12, 131–133 (2015).

If a certain material, device, process, or analytical technique is advantageously paired (e.g., with a certain application or other component), we might describe it as **suitable** or, if the pairing is particularly apt, **well-suited**:

> "…a battery system that combines a water-based electrolyte with an organic redox-active material and a **suitable** low-cost membrane." Janoschka et al., *Nature* 527.7576 (2015).

> "…AFM nanoindentation is a **well-suited** method to analyse local mechanical properties of small volumes…" Peisker et al., *Nature Communications* 4:1661 (2013).

Beneficial and **advantageous** have a field-specific meaning in genetics (namely, to provide an evolutionary benefit) but can also be used in a more generic sense when a benefit is conferred to practitioners (or humanity in general) by a certain result, process, or device, as in the following:

> "These results indicate that the **beneficial** effects of diet on metabolic health may require…" Brüssow et al., *Nature Biotechnology* 32, 243–245 (2014).

> "…the future design of heterogeneous catalysts with **advantageous** reaction capabilities for other important processes." Fortea-Pérez et al., *Nature Materials* 16, 760–766 (2017).

Let's now move in the other direction, away from excellence. Again, the reason that "good" is such a dull descriptor is that it spans such a broad range of quality. Techniques or devices that simply meet requirements might be more precisely described as **adequate**, **acceptable**, or **sufficient**:

> "An annealing temperature of 65 °C, extension time of 8 min at 68 °C and 35 cycles provided **adequate** results for both *Rb1* and *Srgn*." Yong et al., *Nature Communications* 5: 5799 (2017).

> "Many researchers neglect the fact that the high field needed to achieve **acceptable** charge collection efficiency (that is, an **acceptable** sensitivity) can also lead to an unacceptably large dark current." Kasap et al., *Nature Photonics* 9, 420–421 (2015).

> "Whole genome sequencing projects must produce a **sufficient** number of sequence 'reads' covering each nucleotide in the genome" Paterson *Nature Technology* 33, 491–493 (2015).

Satisfactory is an acceptable replacement for "good" but is nearly as vague:

> "…indicated that the drug significantly (both statistically and clinically) improved the number of **satisfactory** sexual events…" Nappi et al., *Nature Reviews Urology* 13, 67–68 (2016).

Satisfactory is still better than "good," however, because at least **satisfactory** implies that certain requirements were satisfied (as exemplified in the *Nature Reviews Urology* paper).

In some cases, our measurements might feature a signal, spectral peak, or change in response that is easily distinguished and merits mention. Referring to such a feature as a "good peak" (for example) sounds too close to "a peak I was fortunate to find, because

otherwise I was going to lose funding." **Prominent**, **unambiguous**, or **notable** are better alternatives, as in the following:

> "Interestingly, both UV-LDI MS and GCMS analysis of *bond*^{e03675} extract revealed a **prominent** signal at *m*/*z* 377…" Ng et al., *Nature Communications* 6: 8263 (2015).

> "…the molecular fingerprints disappear, providing **unambiguous** evidence that the TERS signals…" Zhang et al., *Nature* 498.7452: 82–6 (2013).

> "The **notable** peak at 287.3 eV (corresponding to aliphatic C–H and phenolic C–OH), apparent only in the planted biochar-amended soil, …" *Nature Climate Change* 7.5: 371 (2017).

Let's note at this point that one of the reasons that "good" is (over)used is that it lets us avoid making a stand—who can say what a "good signal" really means? It strengthens our narrative (and adds refreshing variety) to more precisely refer to a "**substantial increase** in signal strength" or, better still, "a signal with a **notably high signal-to-noise ratio of >40**," which is more effectively quantitative.

Of course, one of the implications of stating a conclusion is that a reviewer (and ultimately, scores of readers, if we're lucky) will soon be evaluating that conclusion. Thus, when we describe a measurement as "unambiguous," there truly must be no ambiguity. This caution is particularly important in the case of the next few qualitative descriptions, which are useful for summarizing our contributions in abstracts and conclusions but lose impact if used cavalierly. The following qualitative terms should not be strewn about to convince the reader without evidence but used rather to reinforce quantitative or otherwise objective findings.

Favorable and **strong** are utility players that can be used broadly to describe positive potentials, outcomes, and capabilities. Witness:

> "…we found that the scaffolds had **favorable** biophysical and structural properties and that scaffold immunization of rhesus macaques induced RSV-neutralizing activity." Correia et al., *Nature* 507 (7491): 201 (2014).

> "Resistive random access memory based on the resistive switching phenomenon is emerging as a **strong** candidate for next generation non-volatile memory" Lee et al., *Scientific Reports* 3: 1704 (2013).

In addition, the terms **effective** and **enabling** (along with **useful** and **valuable**) highlight capabilities that move the field forward:

> "These results indicate that ion-mobility mass spectrometry is an **effective** tool for the analysis of complex carbohydrates." Hofmann et al., *Nature* 526.7572 (2015).

> "…microfabrication is an **enabling** technique for cellular studies…" Hao et al., *Scientific Reports* 7: 43390 (2017).

If a result is eagerly sought, it might be described as **desirable**; if consensus favors it, it is **preferred**:

> "Chemical cross-linking with formaldehyde leads to **desirable** cross-links not only between proteins (intermolecular cross-links) but also between…" Mohammed et al., *Nature Protocols* 11, 316–326 (2016).

> "Whereas extinction of a target population may be the **preferred** outcome in the case of pathogens, …" Lindsey et al., *Nature* 494.7438 (2013).

Improved or **enhanced** (or **augmented** when capability is concerned) is a fitting choice as long as evidence of improvement is thoroughly documented:

> "This study demonstrates how utilizing unique hierarchical structures in artificial materials can yield **improved** performance." Plummer, *Nature Materials* 14.11 (2015).

> "We also demonstrate the **enhanced** capabilities of this instrument through the analysis of several challenging protein–nucleic acid assemblies." van de Waterbeemd et al., *Nature Methods* 14, 283 (2017).

Furthermore, an investigation (or the resulting state of understanding) that leaves few questions unanswered can be described as **thorough** (or **extensive** or **comprehensive**)—but let's be wary of provoking a reviewer to eagerly argue why our results are anything but:

> To improve treatment strategies for anxiety, a **thorough** understanding of the neural circuits governing this emotional state in health and disorder is needed." Calhoon and Tye, *Nature Neuroscience* 18:1394 (2015).

> (Note that Calhoon and Tye are describing an ideal state here.)

Let's now move to even more assertive language for promoting our work. The terms **excellent** and **outstanding** (or **exceptional**) require solid evidence to support the implied strong claims:

> "Fluorinated dendrimers achieve **excellent** gene transfection efficacy in several cell lines…" Wang et al., *Nature Communications* 5: 3053 (2014).

> (Wang et al. justified this claim with several figures showing substantial improvements in transfection efficacy relative to controls.)

> "Several new materials with **outstanding** properties have been fabricated with this new technique: nanoporous Si for battery anodes with extremely long cycle fatigue, ultra-high surface area non-porous Nb

> for electrolytic capacitors and Cu–Ta nanocomposites with outstanding material properties." Geslin et al., *Nature Communications* 6: 8887 (2015).
>
> (Note that Geslin et al. are referring to others' accomplishments when they use this term.)

We now come to **superior**, which—used perhaps once in the abstract or conclusion—is extremely effective. When we use **superior**, however, there should be no doubt in the reader's mind of the difference we describe:

> "Our box model results (Fig. 4c) provide **superior** data prediction of the deep-water aragonite saturation isopleths" Luo et al., *Nature Communication* 12821 (2016).
>
> (Note the reference to quantitative results in the figure.)
>
> "…we obtained **superior** product separation from crude reaction-mixture samples using a loading flow of 1 mL/min." He, *Scientific Reports* 7: 8867 (2017).
>
> (The body of the paper presents quantitative comparisons to support this claim.)

Finally, let's emphasize that certain alternatives to "good" are inappropriate for our research papers. Terms such as "tip-top," "first-class," and "first-rate" are colloquial; that is, they're too informal for the academic literature. Others, such as "fantastic," "satisfying," or "marvelous," have a strong emotional component that sounds out of place. Even the style guide of our specific journal of interest may side against certain words (such as "obvious," "interesting," or "novel") that the journal's editorial staff might consider self-apparent, subjective, or overused. Regardless, the other terms surveyed in this note provide a variety of alternatives to ensure that our message is accurately conveyed.

About the author: John M. Maloney (*http://john.maloney.org*) holds a Research Affiliate appointment at MIT's Department of Materials Science and Engineering, where he received his Ph.D. in 2012 in the area of biological cell chemomechanics. He has published research reports in *Nature Biotechnology* and *Nature Materials* and holds 10 patents in the area of microfabrication and medical device design. As a freelance technical editor, he has edited over 1,000 manuscripts, focusing on helping non-native English speakers articulate their research results with sophistication and technical precision.