Presentation of science

Are exaggeration and overselling problems in optics?

Not unlike a bestselling novel, an exceptional research paper often has an enthralling 'story'. However, the way in which that tale is told is very important; clearly conveying the importance and potential of a result can be as important as the scientific novelty of the result itself. If the significance of a result is not clearly explained in a well-written manuscript, great science may go unnoticed and valuable insights could become buried among the proliferation of published works.

It is clearly difficult to assess the long-term impact of research when preparing a manuscript. Consequently, it is hard to know how positive and upbeat to be when describing the implications and future visions of research. On the other hand, there should be no ambiguity in the description of the core results and their physical interpretation. Scientific rigor and accuracy should therefore be at the top of an author's priorities. The need to be accurate is not limited merely to the presentation of selected results. Results may be accurately presented by themselves, but they may not be properly conveyed if other pertinent results, details or discussion have been selectively omitted to make the research appear in a more favourable light. Although this may seem relatively innocuous, it betrays a lack of scientific rigor or even questionable ethical integrity. It is even possible for a knowingly flawed concept to be published in the literature. In both cases, the reliability of the scientific literature is compromised to some degree.

Another practice that reduces scientific clarity is the use of hyperbole. Exaggeration is inappropriate when seeking to describe science, its implications and potential real-world applications accurately. For example, a micrometre-scale phenomenon or structure should not be described as nanoscale. Wouldn't it be better for the advancement of science to simply write about the genuinely positive aspects of research, rather than stretch the language to 'elevate' the work towards popular topics such as nanoscale materials and structures? Similarly, terms such as 'deep subwavelength' and 'sub-diffraction limit' should be reserved for effects whose spatial scales are significantly smaller than the wavelength and the diffraction limit, respectively, rather than of the same order.

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Caution should also be exercised in the use of descriptors such as 'strong', 'high' and 'low', and to define clearly their meanings in each context; comparative clauses are useful only when defined relative to something. For example, 'strong localization' of electromagnetic waves is meaningless without providing a relative definition of 'strong'. Similar concerns arise with many commonly used terms such as 'ultrafast', 'high speed' and 'low loss'.

A related point is the style of speculation. Some speculative discussion can be insightful and valuable. On the other hand, it can also be misleading if it is not based on reasonable scientific foundations. Speculation is sometimes used to enhance the novelty of a manuscript by suggesting attractive but unfeasible applications of a work. To reiterate, forward-looking discussion can be incredibly valuable, but only when the directions discussed lie within the realm of logical possibility and are scientifically based (even if they are presently unachievable).

In addition to muddying the scientific waters, there is another problem associated with overselling or overclaiming. Not clearly describing what was achieved adds to the growing difficulty of finding important or relevant publications. A further problem is that exaggerations or seemingly harmless inaccuracies can hinder future studies from achieving their deserved levels of prominence. For example, if an individual claims to have fabricated a picometre-sized laser, when really they have only made a small nanolaser, how will genuine evidence of a picolaser be published prominently and receive the recognition it merits?

At *Nature Photonics*, we strive to remove hyperboles and unfounded claims from the manuscripts we publish. However, we usually do not refuse to peer-review a manuscript solely because it contains minor hyperboles, particularly if we feel the research has significant potential and the manuscript could be corrected by simple revision. Obviously, this may not be possible if the claims are over-extravagant, but as editors we must gauge the significance of a paper based not only on the initial submission but also on its potential after future revision. Nevertheless, authors should be mindful that exaggeration is often transparent and may make it more difficult to assess the true potential impact of a study. Furthermore, if the potential impact of a study is unclear, we may be disinclined to send a manuscript to peer-review. Let us also not forget that we rely heavily on experts in the fields — the referees — to guide us in these aspects, and we are grateful to them for giving their valuable time as a service to the scientific community.

We strongly encourage editors, authors and referees to be mindful that the interests of optics, science and ultimately society will be best served in the long term if the communication and dissemination of science are both accurate and scientific. ❐