

Cause, correlation, conjecture

Attention to accurate representation of claims within a research article together with the evidence and method supporting each claim can expedite peer review. Accurate citation of the claims of others is essential to avoid prematurely closing possibly productive research strategies.

From our experience in teaching *Nature Masterclasses* on manuscript construction and improvement (<http://msc.macmillan.com/en/training/sponsored-workshops>), we have been struck again by the amount of repetition of claims and arguments in most research articles. The main claims of the paper are detailed in the title, abstract, introduction, results, figures and discussion as well as in the methods as if to hypnotize the reader into accepting the authors' conclusions. What frequently gets lost in the process of selling the argument is the semantic structure of the paper, and it is mainly the latter that convinces the editors to send the paper to review and allows the referees to assess its validity.

Our recommendation in planning a research paper is to lay out the claims together with the supporting evidence and methods in a three-column table. The rows follow one another logically as one experiment or analysis follows necessarily from its predecessor. This simplified structure, popularized as a learning tool in the university teaching of David Dressler (*Nat. Genet.* **46**, 1044, 2014, [doi:10.1038/ng.3099](https://doi.org/10.1038/ng.3099)) among others, permits rapid peer review and can be used to assess student comprehension of the contents and structure of a scientific argument.

Another barrier to successful scientific communication is confusion about how to state what is being claimed. Where factors necessary and sufficient for the observations are robustly demonstrated, a causal connection should be claimed. Where associated factors are identified and validated in an independent replication, correlation or association should be claimed. Where

evidence provides increased likelihood or other increased support for the authors' ideas, the claims should be presented in terms of likelihood, conjecture or hypothesis. This simplified and graded schema for claims makes it easier for referees, of whatever linguistic background, to agree or disagree with the authors' claims one by one, expediting peer review. Depending on the level of evidence, the referees and editors can then recommend strengthening the evidence or downgrading the claims accordingly.

Claims that are outside the remit of the experimental work offered should be avoided. For example, we have published numerous corrections to overstated conjectures of biological novelty within genomic resource papers that have subsequently been easily refuted by alert readers.

In citing the claims of others, we already allow unlimited references in order that the original publications may be credited. As hypotheses can all too readily become 'facts' merely by citation (*BMJ* **339**, b2680, 2009, [doi:10.1136/bmj.b2680](https://doi.org/10.1136/bmj.b2680)), we would like to reassure authors that when they take extra words to cite a reference as supporting fact or support for increased likelihood or conjecture as such, we will not penalize their word count. Indeed, together with our referees, the editors will be specifically looking for ways to expedite those research papers that express their claims at appropriate levels with supporting evidence and methods.

Greater semantic precision not only enables progress in research but also prevents closing promising avenues of research by piling up roadblocks of misrepresentation. ■