



The art of being found: crafting the right title

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Solid scientific research may get published, but it doesn't always get found. Patrick Matthew, for example, outlined the principles of natural selection as a driver for evolution 28 years before Charles Darwin's *On the Origin of Species*. However, Matthew's book title, *On Naval Timber and Arboriculture*, had no clear link to speciation. It was only at Matthew's prompting that his hypotheses were noted in later editions of Darwin's book. Matthew's contribution to evolutionary science was invisible because of his publication's title.

The editors and publishers of the Journal of Materials Science work to boost the visibility of our submissions. Sometimes, we editors suggest revised titles to an article's authors. The title is the one part of the text that our production staff cannot alter, even if there is a glaring error. Beyond tidying the grammar

of titles, one of our editors may also occasionally suggest pithier, more concise titles. We have found that shorter titles are cited more frequently, and this benefits both the authors and the Journal. Figure 1 illustrates this observation with articles published in this Journal in 2013 and 2014. There is a monotonic decline in the average number of citations as the title length increases.

But the mean values give only part of the story. Shorter titles are more likely to be 'big hitters.' The tops of the whiskers in the bottom panel show the 95th percentile range for citations in each category. What does this mean in practice? One way to look at it is to calculate the fraction of articles that received 10 or more citations. This was the case for better than 1 in 8 (12.5 %) of the articles with fewer than ten title words. For 16 or more words, the fraction dropped to

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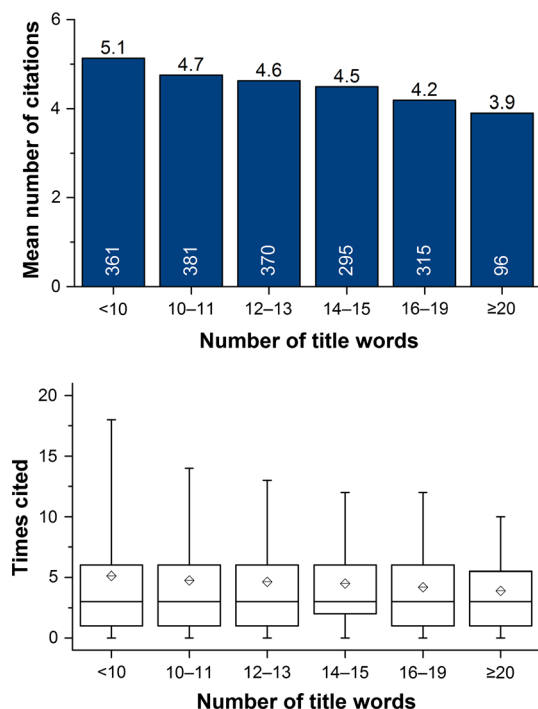


Figure 1 Correlation between title length and mean number of citations for articles from the Journal of Materials Science with a 2013 and 2014 publication year. *Top panel:* Citation counts from the Web of Knowledge Core Collection database, polled on 28 April 2016. The number of articles in each category is given in white at the base of the bar. *Bottom panel:* whisker plot showing the same dataset (whiskers: 5th/95th %ile; box: 25th %ile/median/75th %ile; diamond: mean).

about 1 in 14 (7.0 %). And for 20 or more title words, the fraction dropped to 1 in 32 (3.1 %).

We have some rules of thumb for writing compelling article titles.

- *Select searchable keywords* Some authors may use titles that are more like abstracts, thinking this will be easier to be found by those using search engines. At a minimum, the abstract and title will be indexed and searchable; in some cases, the full text will be. Make sure the key search words are in the abstract; they do not all need to be in the title. Think about both what will allow the work to be found and what makes it stand out. ‘Being found’ is making sure there’s an appropriate choice of keywords and synonyms. For example, Web of Knowledge lists about 42000 papers on titania ‘synthesis,’ but only (!) 29000 on titania ‘preparation.’ A good abstract will include both terms.

‘Standing out’ means making sure that the key novelty is evident in the title.

- *Get rid of unneeded words* We editors check the published literature to make sure work is ‘novel,’ so that isn’t needed in the title. A lot of syntheses are called ‘facile,’ but this is a matter of perspective. The materials being studied may have ‘enhanced’ or ‘improved’ properties, but these need a point for comparison and the title isn’t the place to state that. All these distractor words add length but not impact.
- *Save complicated chemical formulas for the abstract, main text and keywords* Greek letters, superscripts, and subscripts are indexed differently by database compilers and may not appear when someone is searching for related work. The compound $\text{MoBi}_{2-x}\text{Cu}_x\text{Se}_4$ gets mangled to ‘MoBi2-x Cu (x) Se-4’ when indexed by Web of Knowledge. So ‘carbonated hydroxyapatite’ is more likely to be found than ‘ $\text{Ca}_{10}(\text{PO}_4)_{6-x}(\text{CO}_3)_x(\text{OH})_{2-x}$.’ Assume that search engines are ignorant of chemistry and won’t equate, say, TiO_2 and titania, so make sure to include the formulas in the abstract or keywords. (TiO_2 is one of the exceptions—we use it as a word: Tea-Eye-Oh-Two!) As a guideline, if there are more than two elements in a chemical formula, leave it out of the title.
- *Use prepositional phrases instead of long adjectival phrases* This is particularly important with multi-part chemical names. A title containing ‘metal coordination compounds intercalated clay minerals’ is more clearly written as ‘clay minerals intercalated with metal coordination compounds,’ or, better still, just ‘intercalated clay minerals.’
- *Remember to check grammar and spelling* English errors in the title make a poor first impression and mean that those articles will not pass initial editorial review. Be sure to include articles (a, an, the) and use plurals appropriately. Though we value succinct titles, article titles are not newspaper headlines.
- *Make sure the title is unique* Just as book authors do, check that exactly the same title has not been used previously.

More effective titles benefit everyone in the publication process. Articles with better titles spend less time in review—they may attract an invited reviewer’s attention better—so the time between submission and publication is shorter. Leading journals, like the

Journal of Materials Science, include the title of the articles in the list of references. In the USA, the National Science Foundation requires that titles are included on all proposals. This additional visibility of article titles may also influence the results as shown in Fig. 1. These articles then attract more citations, raising not only the profile of the authors of that particular article, but also the profiles of all the other

the contributors to our Journal through an increase in the Journal's impact factor.

Active scientists and engineers know that peer-reviewed publications are the culmination of months or years of work in the lab and on the laptop. As the Matthew/Darwin example illustrates, crafting the right title can make the difference between being famous and being a footnote in scientific history.