

First Impressions of *Your* Science: Title Matters



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Scientists seem to have less time than ever to do science. What it means “to do science” is obviously going to be dependent upon your area of research and workplace, but it will certainly require reading of the latest scientific publications in your domain, writing of reports and papers, preparing presentations and talks, meeting with your team, answering/responding to your superiors, and depending upon your stage of career, working many hours in the lab or at a computer workstation. It feels like we are constantly pulled in multiple directions simultaneously.

Within the context of these multiple work pressures of being a scientist, now put yourself in the position of the early career scientist, such as a graduate student, reviewing the literature and writing one’s very first scientific manuscripts. Consider what is coursing through their mind as they peruse whatever database or publisher website they are accessing to find and read papers. Typically, they are using the titles to very rapidly determine the relevance of the publication to their work; these decisions are made quickly as they skim titles of papers in Web of Science, Google Scholar, ResearchGate, the ACS Publications Web site, etc. As a result, your choice of manuscript title is absolutely critical with respect to capturing the attention of a potential reader and eliciting that crucial click to download and read your paper. Human psychology is underpinned by templates and biases upon which we base decisions. We use the information at hand, framed by these templates and biases, to arrive at a solution in as fast as 30 ms.¹ From an evolutionary perspective, it makes sense that the animals that can perceive dangers and recognize food sources faster will survive, as those with faster processing speeds will have an advantage. That rapid decision making is harnessed in the modern world in a decision to read a paper.

Circling back to the graduate student in the midst of a literature search, one of the biases in play is first impression bias,² which is an integral part of the innate human decision tree to click or not to click. Your title matters so much - it is your chance to summarize your months and probably years of work to a potential reader. You have only one opportunity to make that first impression. The necessity for a succinct yet compelling and digestible title has never been more important, and here we summarize some tips that will help you jump the hurdles of writing a title to encourage busy researchers to click on your paper.

This editorial builds on prior pieces authored by ACS Publications editors Prashant Kamat,³ George Schatz,⁴ and this author/editor.⁵ A useful schematic by Prashant V. Kamat, Editor-in-Chief of *ACS Energy Letters*, is reprinted in Figure 1 that summarizes the five key elements of an effective title. Every

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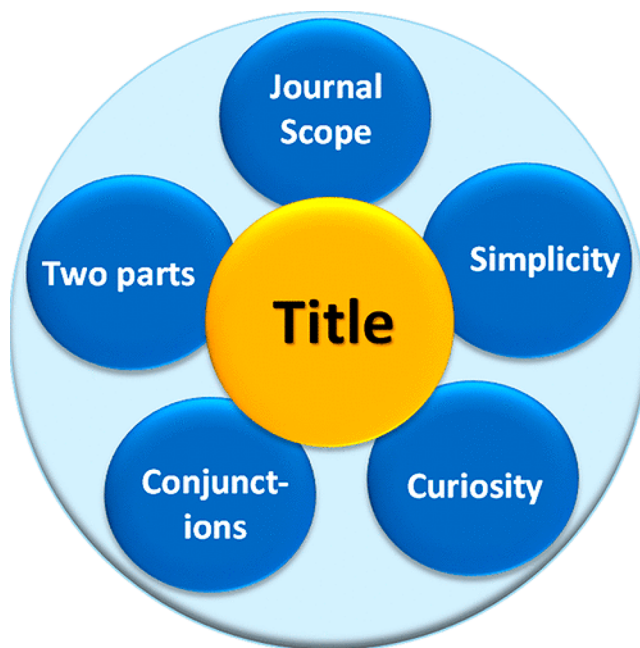
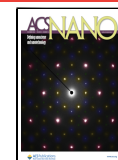


Figure 1. Five elements of an effective title. Image reproduced with permission from ref 3. Copyright 2021 American Chemical Society.

title should strive to meet as many of these five elements as possible while being succinct and to-the-point.³ To prove the validity of this five-point model for titles, five of our most highly downloaded papers from *ACS Nano* (from the “most read” link on the website) are listed below and analyzed.

- (1) (Review) **Lipid Nanoparticles—From Liposomes to mRNA Vaccine Delivery, a Landscape of Research**

Published: December 27, 2022



Diversity and Advancement (<https://pubs.acs.org/doi/10.1021/acsnano.1c04996>).

Journal scope: This article is a review on lipid-based nanoparticles, so it clearly fits scope.

Simplicity: For a very extensive review with almost 300 references that covers a range of applications, the title is simple and effective, starting with the subject and then providing some hints as to the breadth of coverage and forward-looking analyses.

Curiosity: The terms “landscape of research diversity and advancement” suggest valuable interpretation by the authors that reflects their viewpoint as experts in the area.

Conjunctions and two parts: The authors use a hyphen to break the title into two parts. The first part provides the noun, “lipid nanoparticles”, and the second hints at the scope of the review.

- (2) (tutorial) **Tutorial on Powder X-ray Diffraction for Characterizing Nanoscale Materials** (<https://pubs.acs.org/doi/10.1021/acsnano.9b05157>).

Journal scope: This piece is a tutorial discussing XRD-based characterization of nanoscale materials, which is an essential technique for many papers in the journal, and thus clearly falls within the scope of the journal.

Simplicity: The title is short, simple, and practical. No superlatives or adjectives needed.

Curiosity: It is clear that the tutorial will teach the reader the basics, and because it was written by experts, it sparks curiosity as the authors will certainly provide important tips or insights.

Conjunctions and two parts: No conjunctions needed as the title is already concise.

- (3) (article/original research) **Targeting to Tumor-Harbored Bacteria for Precision Tumor Therapy** (<https://pubs.acs.org/doi/10.1021/acsnano.2c08555>)

Journal scope: The article describes original research revealing bacteria-targeted mesoporous silica nanoparticles for targeting tumors, and thus fits the scope of *ACS Nano*.

Simplicity: The interesting application forms the theme of the title. No overly technical details or chemical names distract from the focus and the “story”.

Curiosity: The title leaves the reader curious as to how bacteria within tumors can be targeted and the efficacy of the approach.

Conjunctions and two parts: No conjunctions needed as the title is already concise.

- (4) (article/original research) **Surface Topography-Adaptive Robotic Superstructures for Biofilm Removal and Pathogen Detection on Human Teeth** (<https://pubs.acs.org/doi/10.1021/acsnano.2c01950>)

Journal scope: The article describes original research on robotic superstructures comprising magnetic nanoparticles that can mimic scrubbing motions of biofilms on teeth, and thus fits within the scope.

Simplicity: This title is an example of one that is longer than usual for an effective lede. The authors succeed as the subject, the adaptive robotic superstructures, is not laden with overly technical details.

Curiosity: The interesting and unique applications involving robots and human teeth pique the interest of the reader.

Conjunctions and two parts: While not formally divided with a colon (:) or hyphen (–), the title is split

using the conjunction “for”. The title is therefore broken into bite-sized pieces, starting with the subject (robotics), followed by the objects (applications involving human teeth). Easy for the reader to quickly parse.

- (5) (review) **Aerogels Meet Phase Change Materials: Fundamentals, Advances, and Beyond** (<https://pubs.acs.org/doi/10.1021/acsnano.2c05067>)

Journal scope: A review on aerogels, a class of nanostructured materials that fall squarely within the scope of *ACS Nano*.

Simplicity: The reader knows the subject (the meeting of aerogels and phase change materials), and that the review is forward-looking (as signaled by ‘advances, and beyond’).


Curiosity: The title inspires curiosity as the review connects phase change materials and aerogels, which is a very interesting intersection of topics.

Conjunctions and two parts: The title uses a colon to break the title into two parts. The first part provides the subject, “is”, and the second tells the reader that the review is more than a summary of published data.

In addition to these five key elements of a successful title, we also include a list of “please do not do these things”:

- (1) **Avoid the words ‘report’, ‘study’, or ‘effects of’.** These words are meaningless and send a strong message to a potential reader that the paper describes only incremental work with no real insights or interpretations. If you have written a draft title with these words, remove them and rethink what your paper is actually about. Yes, you performed a study, but what did you learn? It is your job to distill what is important and to share this new information and insights with the reader.
- (2) **Avoid buzzwords and superlatives as they are meaningless.** Let the reader decide if the work is “superior” (superior to what?), “unprecedented” (all scientific publications contain new data, which would be unprecedented to some degree), “high efficiency” (compared to what, and will it be considered to be high efficiency in the future?), green (note that green chemistry is a defined area with principles associated with it,⁶ and cannot be used indiscriminately), etc. These words are frustrating and meaningless.
- (3) **Whenever possible, avoid chemical nomenclature in the title.** Long technical names along the lines of (1,1'-biphenyl)-4,4'-diamine, etc. in the title are challenging to parse and are an indication that a paper could be an arduous read. Do not unintentionally give the potential reader a negative impression that your work is going to be a slog to read and digest.
- (4) **Avoid abbreviations in the title.** Many of your readers will not immediately recognize TPD, HER, PEG, VPO, GO, TMB, for example. Some abbreviations may have multiple meanings and represent different materials or compounds in different areas. Please do not force your potential readers to use a search engine to understand terms in your title because many will not bother, instead skipping your paper and moving on to the next.
- (5) **Rethink very long and cumbersome titles that comprise the four “please do not’s” from above.** They are too difficult to read. Imagine seeing a paper entitled “High efficiency unprecedented reaction of nanoscale particles *N,N'*-Bis(3-methylphenyl)-*N,N'*-bis(phenyl)-benzidine

with cadmium sulfide quantum dots on reduced GO in water-based solvents for green photocatalytic hydrogen evolution reaction (HER) and overall water splitting with high solar irradiation". Ask yourself if you would have been able to easily grasp the theme of a paper from such a title. Instead, from such a proposed title, extract the essential nouns (the four or five of them) that best represent your work, and write a few different versions of the title. Share those versions with your coauthors, and with others not associated with the paper who are seeing it for the first time. Trust them – a shorter and easily understood title will encourage future readers to read your hard-won results!

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<https://pubs.acs.org/10.1021/acsnano.2c11900>

Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

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