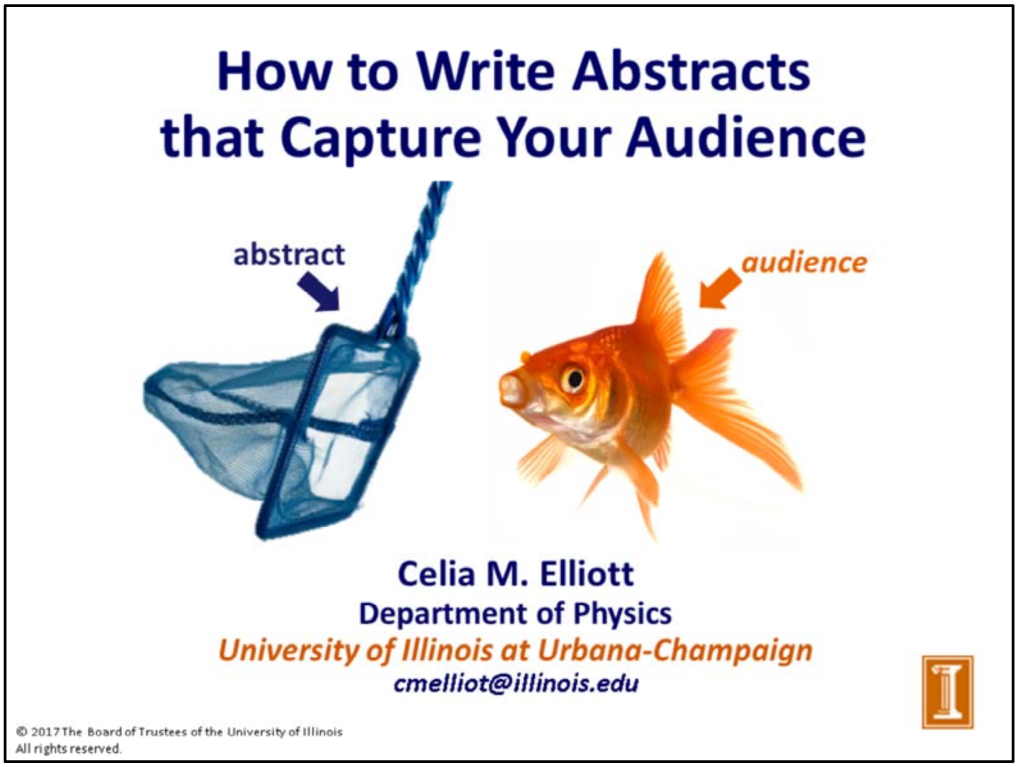
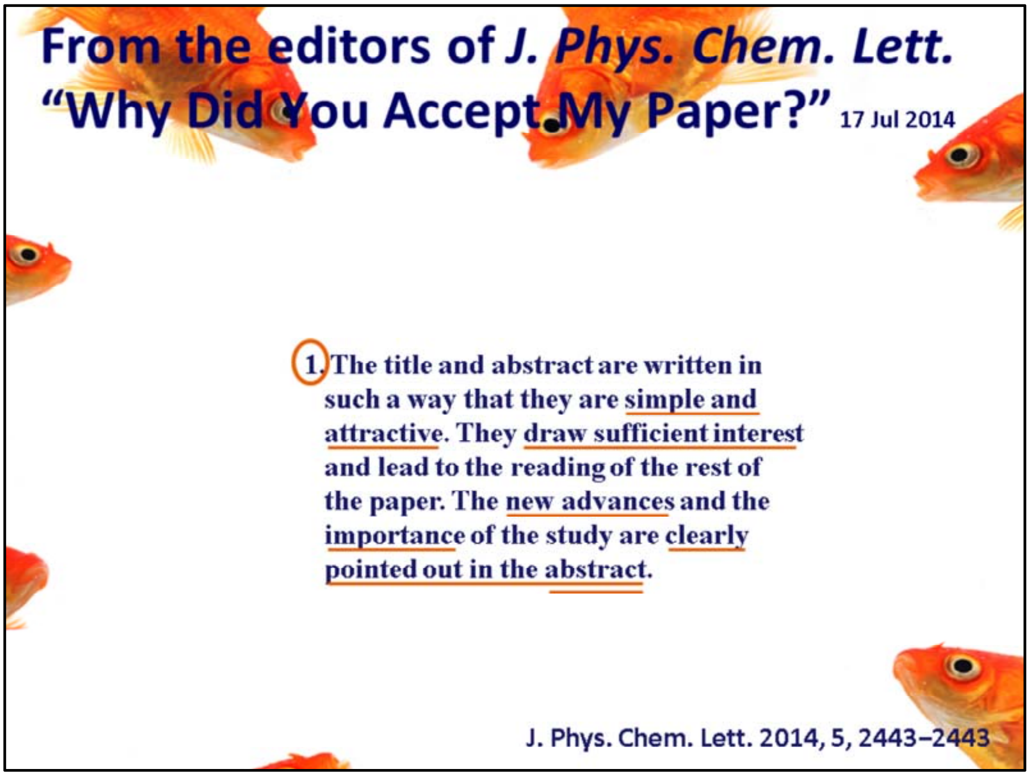


The purpose of an abstract is to provide a snapshot of a paper or a talk for a reader or listener. The abstract should provide an overview of the motivation, methods, results, and conclusions that will be presented in the paper or talk, in sufficient detail so that the reader can immediately tell if the material is relevant to his or her own work.

The effectiveness of your abstract often determines whether anybody besides Mom actually reads your paper or comes to your talk.

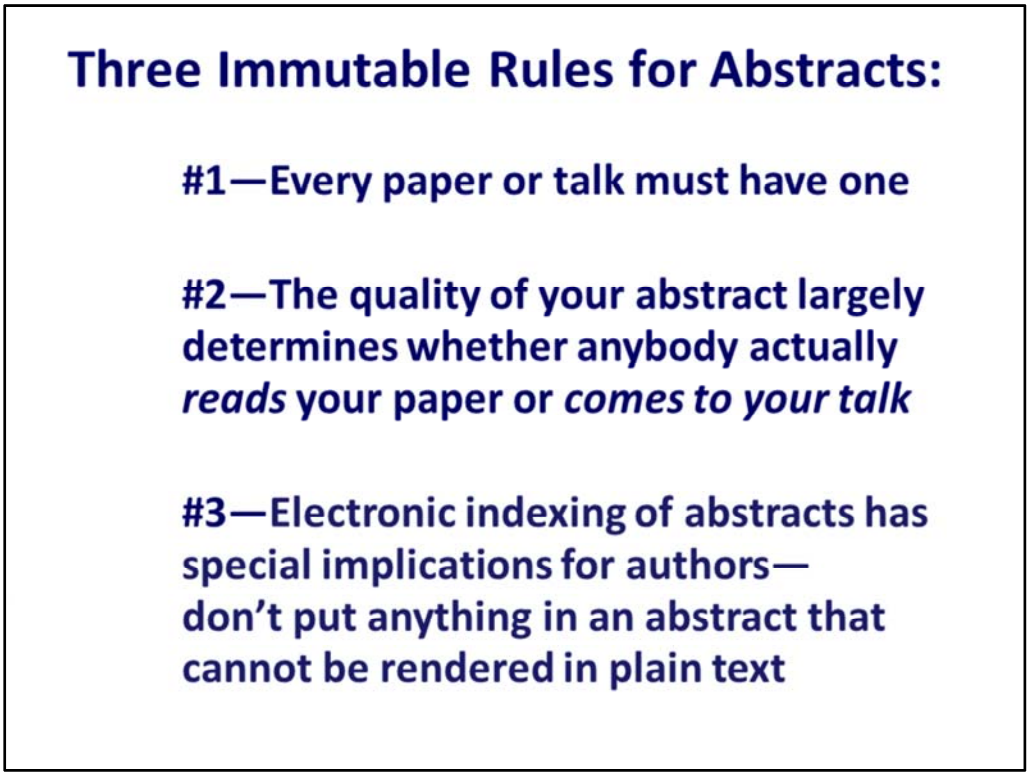
Because abstracts are often published or available online, they also function as a permanent, accessible record of your work.

All images are royalty-free and were purchased from istockphoto.com.



In the July 17, 2014, issue of *The Journal of Physical Chemistry Letters*, the editors present a list of six attributes that contribute to acceptance of a paper for publication in their journal.

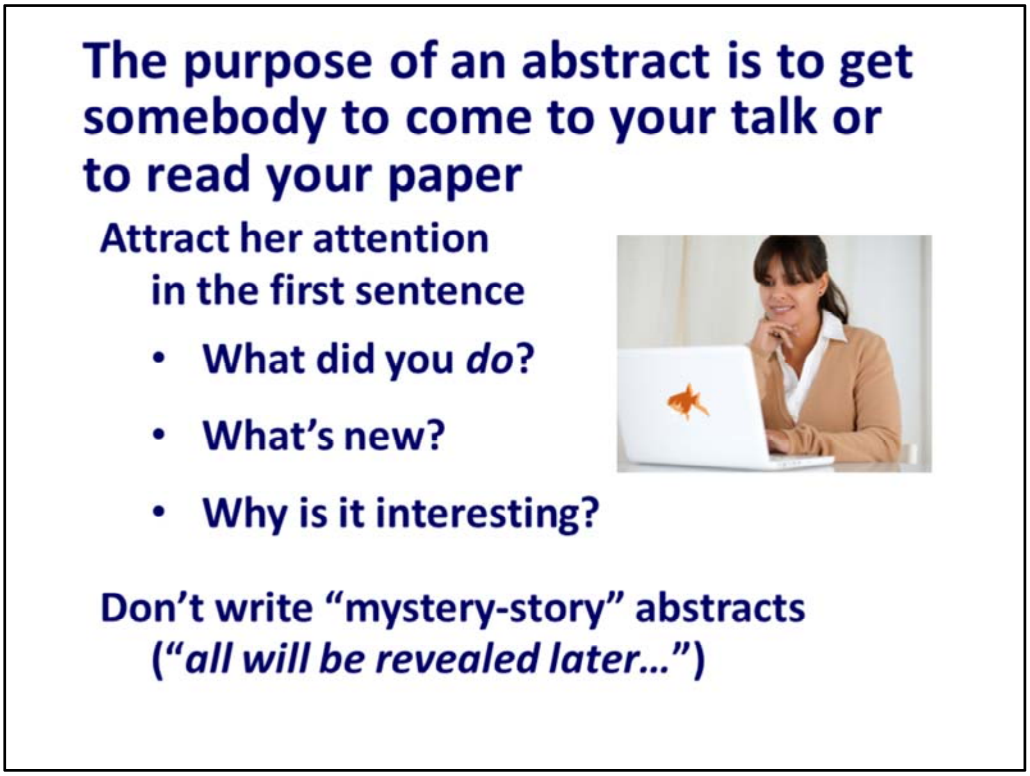
Number 1 on the list is having an effective abstract (and title).



1. Over the course of your career you will write dozens—if not hundreds—of abstracts. Today we'll look at a simple, four-step method that will help you crank out effective abstracts quickly and painlessly.

2. Being able to write effective abstracts—that are tailored for your audience and offer them information they want to know efficiently and compellingly—is an invaluable skill for a scientist or engineer. And like everything else in scientific writing, turning out good abstracts is a learned skill—it's a ***craft***, not an art. Good technical writing requires learning basic techniques and practicing them over and over until they become second nature. Today, we'll apply one of those methods to abstracts.

3. In addition to being printed in the journal or the meeting program, abstracts are entered into electronic databases by commercial abstracting services, which has implications for how you prepare your abstract. In general, don't put anything in an abstract that cannot be rendered in plain text.



In today's world of information overload, people make snap decisions about what to keep and what to discard in seconds. Make your first sentence ***count!***

The abstract should provide a snapshot of the complete paper or talk, just as the small inset on the top right shows the complete image. Merely repeating the first paragraph of the background and introduction section is ***not*** adequate for an abstract.

An abstract should "stand alone"—it should provide a reader with a complete view of the paper or talk to come.

Write the abstract ***after*** you've finished the paper. Writing is an evolutionary process, and the focus or emphasis of a paper may change during the writing. The abstract must reflect the <u>finished</u> paper.

Quiz Question #1

What makes a busy scientist decide to read a paper or come to a talk?

a) The title

b) The reputation of the authors

c) The abstract

d) The references (is his or her own work cited?)

Answer: Probably all of the above

a) The title

b) The reputation of the authors

c) The abstract

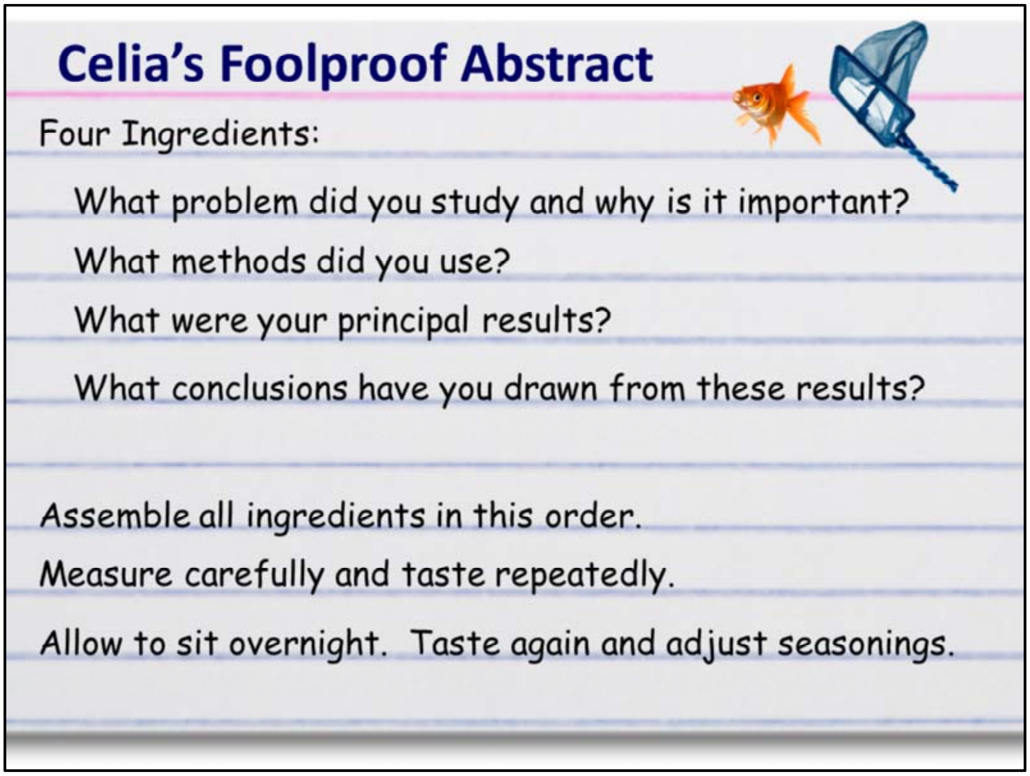
d) The references (is his or her own work cited?)

If you're a young scientist without a big reputation yet, you *must* pay particular attention to providing an effective title* and a **GOOD ABSTRACT!**

* http://people.physics.illinois.edu/Celia/Titles.pdf

To whip up a perfect abstract...

follow the recipe!



Celia's foolproof abstract recipe:
Answer the following questions, in this order, in one or two sentences each:

- What problem did you study and why is it important?
- What methods did you use?
- What were your principal results?
- What did you learn? What have you contributed?

Make your sentences as <u>specific</u> and as <u>quantitative</u> as possible.

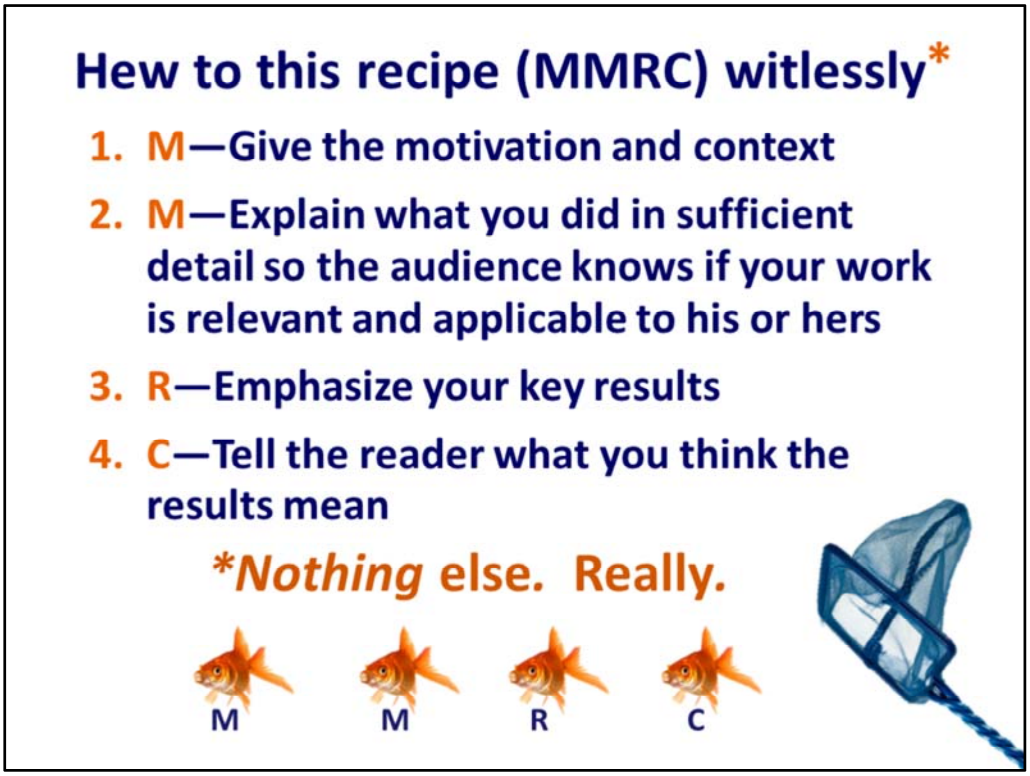
Control the length of the abstract by the length of the answers to the four questions.

- Short abstract?—one-sentence answers
- Longer abstract?—several-sentence answers
- One-page abstract?—one-paragraph answers

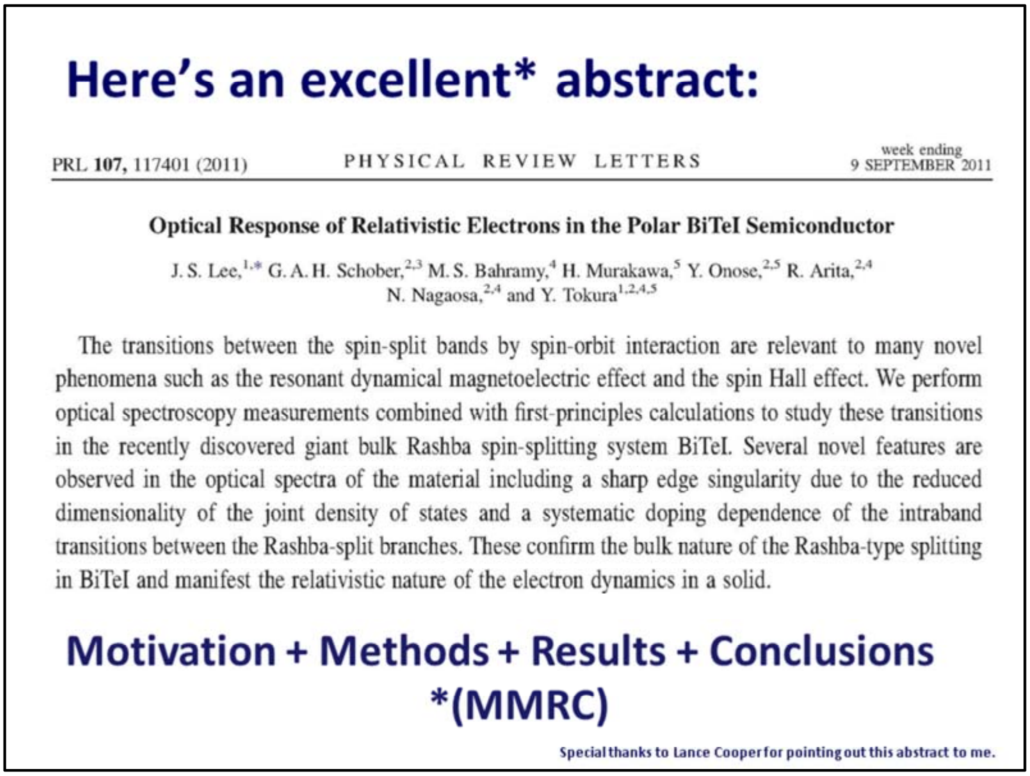
Stick to this 4-ingredient recipe—Don't omit ingredients to shorten an abstract or add superfluous ingredients to lengthen one.

Don't expect to whip up a good abstract** at the last minute. Write it, put it aside for a day or two, and look at it again with fresh eyes.

**or anything else



M = Motivation
M = Methods
R = Results
C = Conclusions



Here's an excellent* abstract:

PRL **107,** 117401 (2011) PHYSICAL REVIEW LETTERS week ending 9 SEPTEMBER 2011

Optical Response of Relativistic Electrons in the Polar BiTeI Semiconductor

J. S. Lee,[1,*] G. A. H. Schober,[2,3] M. S. Bahramy,[4] H. Murakawa,[5] Y. Onose,[2,5] R. Arita,[2,4] N. Nagaosa,[2,4] and Y. Tokura[1,2,4,5]

The transitions between the spin-split bands by spin-orbit interaction are relevant to many novel phenomena such as the resonant dynamical magnetoelectric effect and the spin Hall effect. We perform optical spectroscopy measurements combined with first-principles calculations to study these transitions in the recently discovered giant bulk Rashba spin-splitting system BiTeI. Several novel features are observed in the optical spectra of the material including a sharp edge singularity due to the reduced dimensionality of the joint density of states and a systematic doping dependence of the intraband transitions between the Rashba-split branches. These confirm the bulk nature of the Rashba-type splitting in BiTeI and manifest the relativistic nature of the electron dynamics in a solid.

Motivation + Methods + Results + Conclusions
***(MMRC)**

Special thanks to Lance Cooper for pointing out this abstract to me.

This abstract contains all four required parts of an abstract: motivation, methods, results, and conclusions.

Notice that this abstract is scalable. By providing more or less detail for each of the four elements, the final length of the abstract is easily controlled.

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Motivation + Methods + Results + Conclusions

Note the specificity of the abstract. Examples are given of the “novel phenomena” in the motivation section.

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Motivation + **Methods** + Results + Conclusions

Again, note the specificity. The types of methods (optical spectroscopy combined with *ab initio* calculations), phenomenon (giant bulk Rashba spin-splitting), and the particular system investigated (BiTeI) are specified.

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Motivation + Methods + **Results** + Conclusions

The two novel features of the optical spectra are specified—a sharp edge singularity and a systematic doping dependence.

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Motivation + Methods + Results + **Conclusions**

The final sentence states the authors' conclusions based on the work being reported.

Quiz Question #2

What is the most common mistake that abstract writers make?

a) Including too much introductory material

b) Being vague and overly general

c) Using too much jargon

d) Failing to consider their audiences' wants, motivations, and needs

Answer: I'd say d) *

a) Including too much introductory material

b) Being vague and overly general

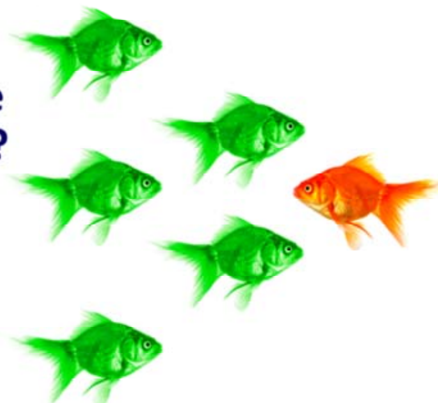
c) Using too much jargon

d) Failing to consider their audiences' wants, motivations, and needs

*Although *any* of these mistakes will cost you readers and listeners

As in any writing project, your first question should be "Who's the audience?"

- What do they already know?
- What's their motivation for reading your article or coming to your talk?
- What is their level of expertise?
- How can you best meet their needs?



Before writing the abstract, think about who will be reading it and why.

One-size abstracts *do not* fit all

An abstract for a journal article is usually more specific and detailed than an abstract for a meeting

An abstract for a specialized journal (e.g., *Phys Rev B*) will be different from one for a general journal (e.g., *Science*)

One size does *not* fit all for abstracts. Although the same organizational structure (MMRC) should be used for every abstract, the level of detail, specificity, and use of specialized language will vary, depending on the intended audience.

No fluff* in your abstract

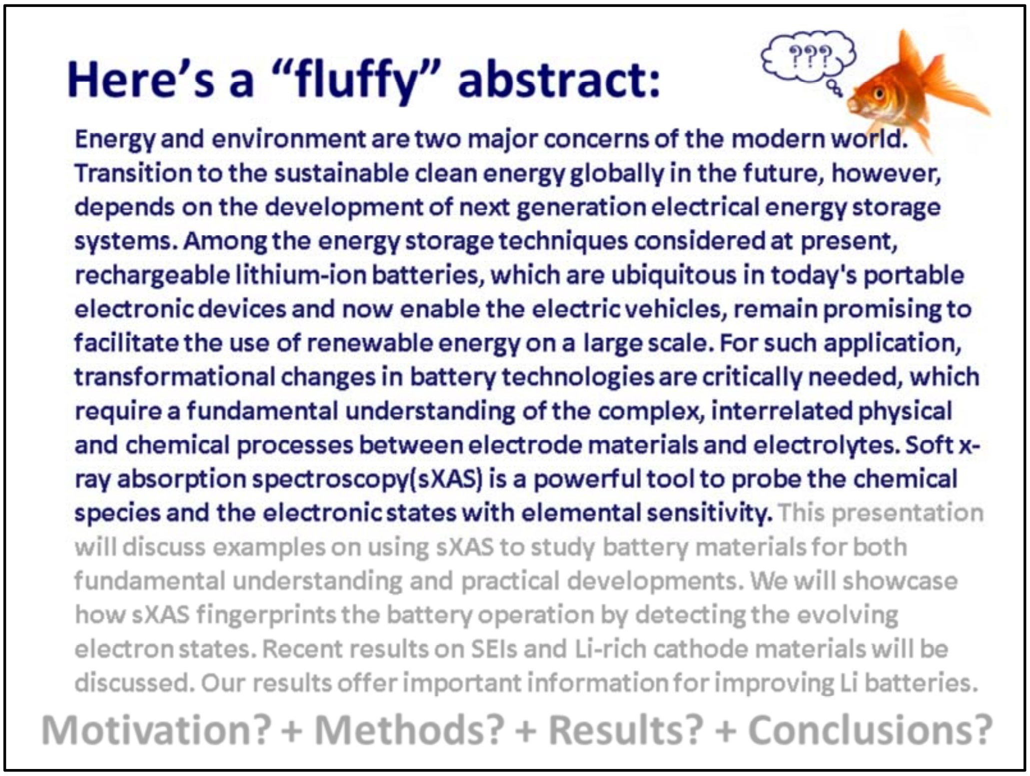
No introductory fluff—get straight to the point in the first sentence

No sweeping generalizations at the end

(No drama either—be objective)

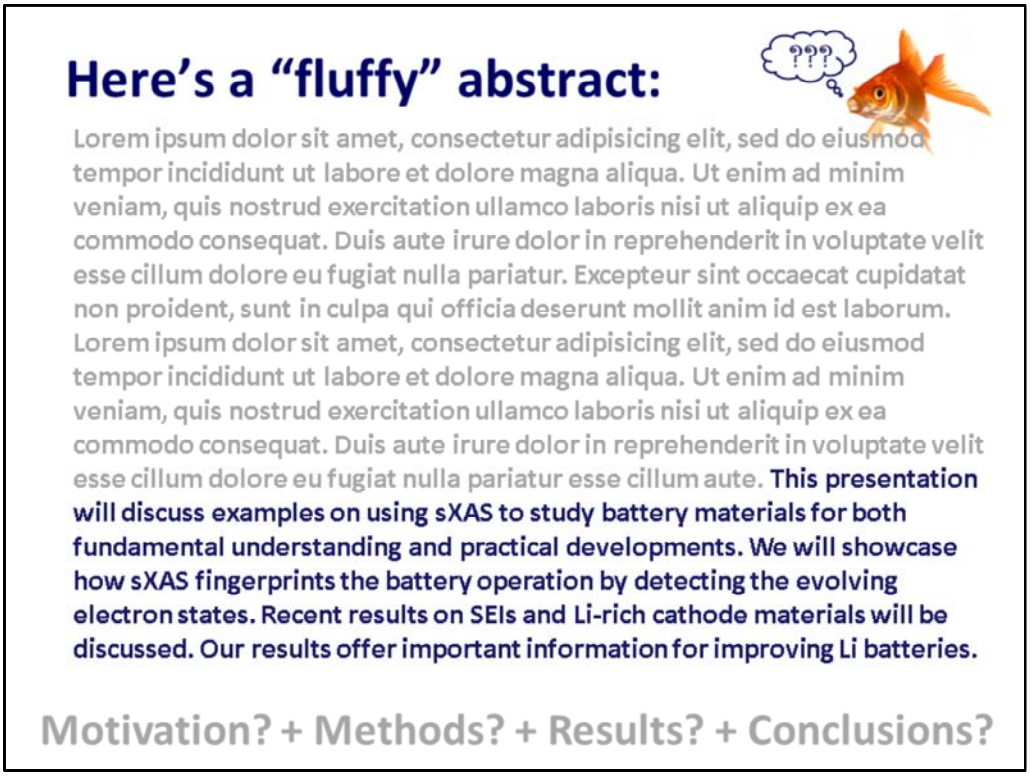
* http://people.physics.illinois.edu/Celia/Lectures/Fluff.pdf

A common failing of many abstracts is that they provide too much introductory material. Don't tell the reader what she already knows, tell her immediately what is new and different about the results being reported.



Of the 174 words in this abstract, 120 (69%) are devoted to an overly general introduction that doesn't tell the audience anything it doesn't already know. Specifics of methods, results, and conclusions are completely absent.

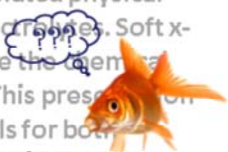
This abstract and talk were actually presented at the March 2014 meeting of the American Physical Society. The author's name and affiliation and the bibliographic citation have been removed to protect the guilty.



The authors might as well have written the first two-thirds of this abstract in Latin—the audience would have gotten about as much out of it.

It's a mystery story, too

Energy and environment are two major concerns of the modern world. Transition to the sustainable clean energy globally in the future, however, depends on the development of next generation electrical energy storage systems. Among the energy storage techniques considered at present, rechargeable lithium-ion batteries, which are ubiquitous in today's portable electronic devices and now enable the electric vehicles, remain promising to facilitate the use of renewable energy on a large scale. For such application, transformational changes in battery technologies are critically needed, which require a fundamental understanding of the complex, interrelated physical and chemical processes between electrode materials and electrolytes. Soft x-ray absorption spectroscopy(sXAS) is a powerful tool to probe the chemical species and the electronic states with elemental sensitivity. This presentation will discuss examples on using sXAS to study battery materials for both fundamental understanding and practical developments. **We will showcase how sXAS fingerprints the battery operation by detecting the evolving electron states. Recent results on SEIs and Li-rich cathode materials will be discussed. Our results offer important information for improving Li batteries.**



Motivation + **Methods? + Results? + Conclusions?**

The whole abstract is maddeningly vague, and the promise that "all will be revealed" in the talk may not be enough of an incentive to get someone to actually come listen to it.

Read your draft abstract critically

Ideas are clear and concise

Language is precise and familiar to your audience

Statements are specific, quantitative, and objective

Conclusions are supported

Text is free of errors

Length limits are observed

Read your (almost-finished) abstract critically:

- Are ideas expressed clearly and concisely? Eliminate every superfluous word.
- Are the words you use precise and meaningful for your audience? Have you used standard nomenclature and notation? Have you defined all acronyms and avoided narrow jargon?
- Have you provided enough information to support your conclusions and show what you've contributed?
- Have you observed standard stylistic conventions? (third person/passive voice?) (objective, unemotional tone and emphasis?)
- Is the text free of grammatical mistakes and typographical errors?
- Does the length of the abstract conform to instructions from the journal or the meeting organizers?


To Recap:
Know thy audience!
Follow the MMRC recipe
Scale your abstract by adjusting the size of the "ingredients," not by adding or omitting any
Don't write "mystery-story" abstracts
Eliminate fluff
Write with the expectation that you will rewrite
cmelliot@illinois.edu
http://physics.illinois.edu/people/Celia/

Notes: