

# 20.109 Communication Workshop 2: Abstracts and Titles (+ some writing basics)

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Helping you communicate effectively.

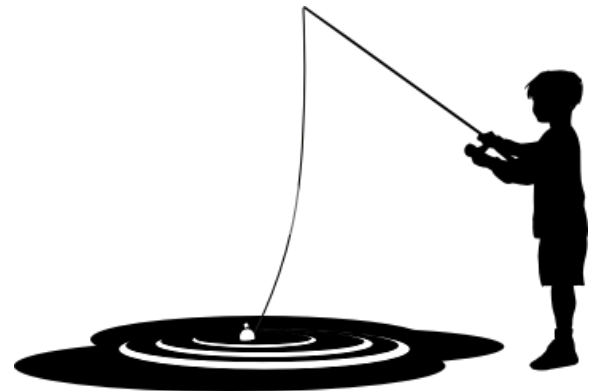
[be.mit.edu/communicationlab](https://be.mit.edu/communicationlab)

# Workshop structure

1. Why subject matters
2. Discuss an example from the field
3. Derive principles and strategies
4. Practice
5. Leave you with a checklist/rubric

# Abstracts and Titles: why do they matter?

- How you attract your audience: first judgment
- Influences whether someone will cite your paper
- Where indexing happens – influences whether readers will find your paper



# Abstract & title must appeal to a broad audience.

- Scientists in your field
- Scientists outside your field
- Editors, reviewers
- Students
- Others

Abstracts and titles are  
written last,  
yet read first.

INTRO  
RESULTS  
figure 1  
figure 2a,b,c  
supp. fig. 6  
table 1  
figure 3  
figure 7  
table 2  
DISCUSSION  
METHODS



# Example abstract

[Proc Natl Acad Sci U S A](#). 2015 Jun 30;112(26):E3421-30. doi: 10.1073/pnas.1424144112. Epub 2015 Jun 15.

## **Streptococcus pneumoniae secretes hydrogen peroxide leading to DNA damage and apoptosis in lung cells.**

[Rai P](#)<sup>1</sup>, [Parrish M](#)<sup>2</sup>, [Tay IJ](#)<sup>2</sup>, [Li N](#)<sup>1</sup>, [Ackerman S](#)<sup>2</sup>, [He F](#)<sup>3</sup>, [Kwang J](#)<sup>3</sup>, [Chow VT](#)<sup>1</sup>, [Engelward BP](#)<sup>4</sup>.

### Author information

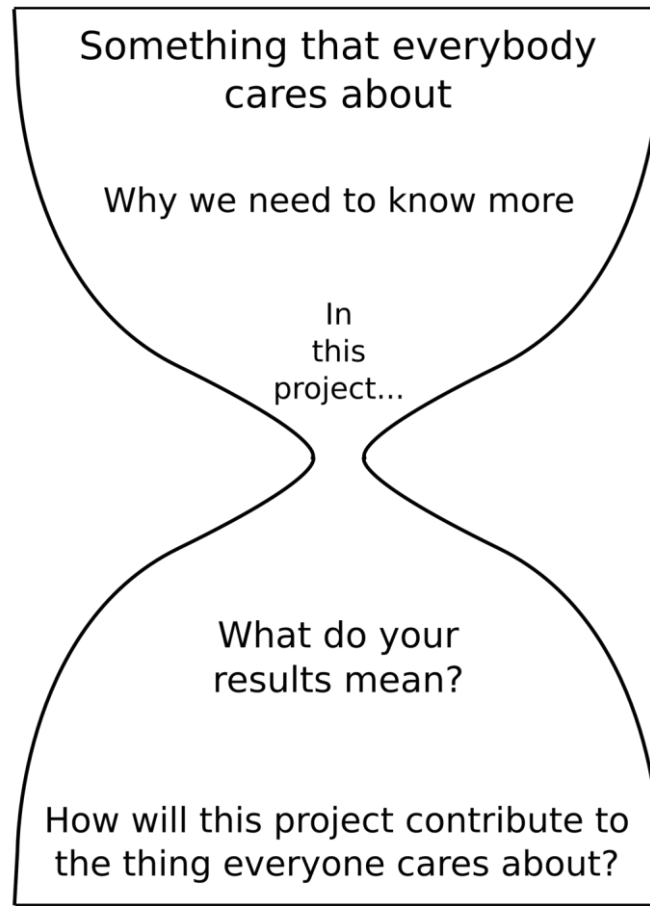
### **Abstract**

*Streptococcus pneumoniae* is a leading cause of pneumonia and one of the most common causes of death globally. The impact of *S. pneumoniae* on host molecular processes that lead to detrimental pulmonary consequences is not fully understood. Here, we show that *S. pneumoniae* induces toxic DNA double-strand breaks (DSBs) in human alveolar epithelial cells, as indicated by ataxia telangiectasia mutated kinase (ATM)-dependent phosphorylation of histone H2AX and colocalization with p53-binding protein (53BP1). Furthermore, results show that DNA damage occurs in a bacterial contact-independent fashion and that *Streptococcus pyruvate oxidase* (SpxB), which enables synthesis of H<sub>2</sub>O<sub>2</sub>, plays a critical role in inducing DSBs. The extent of DNA damage correlates with the extent of apoptosis, and DNA damage precedes apoptosis, which is consistent with the time required for execution of apoptosis. Furthermore, addition of catalase, which neutralizes H<sub>2</sub>O<sub>2</sub>, greatly suppresses *S. pneumoniae*-induced DNA damage and apoptosis. Importantly, *S. pneumoniae* induces DSBs in the lungs of animals with acute pneumonia, and H<sub>2</sub>O<sub>2</sub> production by *S. pneumoniae* in vivo contributes to its genotoxicity and virulence. One of the major DSBs repair pathways is nonhomologous end joining for which Ku70/80 is essential for repair. We find that deficiency of Ku80 causes an increase in the levels of DSBs and apoptosis, underscoring the importance of DNA repair in preventing *S. pneumoniae*-induced genotoxicity. Taken together, this study shows that *S. pneumoniae*-induced damage to the host cell genome exacerbates its toxicity and pathogenesis, making DNA repair a potentially important susceptibility factor in people who suffer from pneumonia.

# Break down this abstract

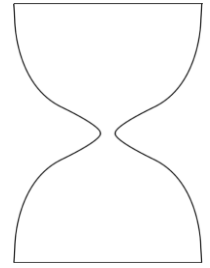
- Streptococcus pneumoniae is a leading cause of pneumonia and one of the most common causes of death globally.
- The impact of *S. pneumoniae* on host molecular processes that lead to detrimental pulmonary consequences is not fully understood.
- Here, we show...(6 sentences)
  - *S. pneumoniae* induces toxic DNA double-strand breaks (DSBs) in human alveolar epithelial cells, as indicated by ataxia telangiectasia mutated kinase (ATM)-dependent phosphorylation of histone H2AX and colocalization with p53-binding protein (53BP1).
  - DNA damage occurs in a bacterial contact-independent fashion and that Streptococcus pyruvate oxidase (SpxB), which enables synthesis of H<sub>2</sub>O<sub>2</sub>, plays a critical role in inducing DSBs.
  - The extent of DNA damage correlates with the extent of apoptosis, and DNA damage precedes apoptosis, which is consistent with the time required for execution of apoptosis.
  - addition of catalase, which neutralizes H<sub>2</sub>O<sub>2</sub>, greatly suppresses *S. pneumoniae*-induced DNA damage and apoptosis.
  - *S. pneumoniae* induces DSBs in the lungs of animals with acute pneumonia, and H<sub>2</sub>O<sub>2</sub> production by *S. pneumoniae* in vivo contributes to its genotoxicity and virulence.
  - deficiency of Ku80 causes an increase in the levels of DSBs and apoptosis, underscoring the importance of DNA repair in preventing *S. pneumoniae*-induced genotoxicity. [preceded by a little background on Ku80]
- Taken together, this study shows that *S. pneumoniae*-induced damage to the host cell genome exacerbates its toxicity and pathogenesis,
- making DNA repair a potentially important susceptibility factor in people who suffer from pneumonia.

# An effective abstract is an hourglass-shaped message.





# Components of an effective abstract



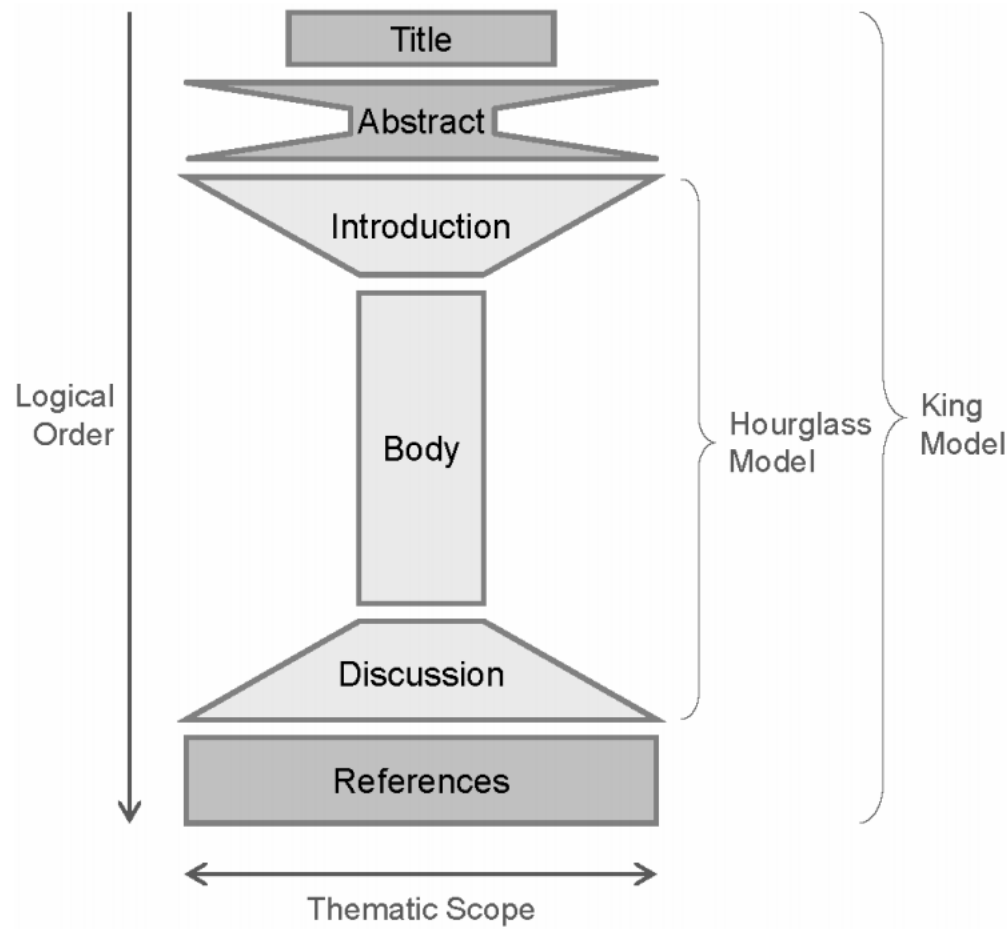
General background	Something everyone in your audience cares about.
Specific background	Zoom in from General Background to the thing you did.
Knowledge gap, Unknown	Question that will be answered by your research. Problem, phenomenon that is not understood.
HERE WE SHOW	Conclusion, answer to the Unknown
Results	Brief summary of approach + very high-level results. Common pitfall = too much Methods/Results.
Implication, Significance	So what? What do your results mean for the thing everyone cares about? Next steps?

# Preview: Abstracts reflect the shape of a full paper.

General background	Something everyone in your audience cares about.	Introduction: beginning
Specific background	Zoom in from General Background to the thing you did.	Introduction: middle
Knowledge gap, Unknown	Question that will be answered by your research. Problem, phenomenon that is not understood.	Introduction: end
HERE WE SHOW	Conclusion, answer to the Unknown	Introduction: end Results: end Discussion: beginning
Results	Brief summary of approach + very high-level results. Common pitfall = too much Methods/Results.	Introduction (high level) Results (high level) Methods
Implication, Significance	So what? What do your results mean for the thing everyone cares about?	Discussion

# Successful scientific writing is fractal.

**Figure 1** The 'Hourglass Model' (light-grey parts) and the 'King Model', which covers an extended set of parts in a typical paper's structure



# Preview: Question and Answer

- In basic research, the answer you get is often NOT the answer you were looking for
- A research paper is the **best story** you can tell about that answer, not a historical document of the route you took to get there.
- The question is the simplest question you can ask for which you have an answer

# Basic writing

- Word choice
- Sentence structure
- Transition phrases and overall logic
- Concise – free of unnecessary words and phrases

# Choose the right word for the context.

- The response was blocked by phentolamine but was not (*affected, effected*) by propranolol.
- The digoxin (*amount, concentration, content, level*) was increased from 0.5 to 2.5 ng/ml.
- At frequent (*intervals, periods*) we measured pH,  $P_{O_2}$  and  $P_{CO_2}$  in arterial blood, and during each (*interval, period*) of study we measured pulmonary blood flow two or three times.
- Seventy-five percent nitrous oxide (*represents, is*) a subanesthetic concentration in the dog.

# Simplify

efficacious    effective

utilize        use

elucidate     explain

proximal      close

# Be quantitative.

development rate was fastest at the higher temperature

development rate at 30°C was 10% faster than development rate at 20°C



# Craft strong sentences.

- Make the topic the subject.
- Put the action in the verb.
  - “An increase in heart rate *occurred*.”
  - “Heart rate *increased*.”
- Avoid long noun clusters.
- Talk about one thing at a time.
- Use parallel construction.
  - “The enzyme neutralizes oxidative damage and has an apoptosis-suppressing effect.”
  - “The enzyme neutralizes oxidative damage and suppresses apoptosis.”
- Keep related words (e.g., subject and verb) together.
- Use the active voice.
  - “More protein was transported by mutant cells.”
  - “Mutant cells transported more protein.”

Make the topic the subject.

The patient showed no change in symptoms.

The patient's symptoms did not change.

Use transition statements to provide a logical relationship between the sentences in a paper.

As a result

Given this observation

According to this theory

In order to accomplish this

# Cut, Cut, Cut

- Shorter sentences are clearer.
- Shorter paragraphs are clearer.
- Shorter papers are clearer.

Eliminate unnecessary words and detail,  
BUT include transitions that make the reasoning  
explicit.

# Titles: What did you find? So what?

Inulin modulates conspecific antagonism towards vancomycin-resistant *B. subtilis* strain BF819 in the human gut microbiome

*versus*

A human gut commensal exhibits targeted antagonism towards an antibiotic-resistant clinical counterpart

# Exercise: Fix this title.

Novel methods for early prediction of undesirable interference by microbial inhabitants of the human gut with metabolism of the cardiac drug digoxin give rise to strategies for alleviating drug inactivation

Cut through title clutter by identifying key terms.

Novel methods for early prediction of undesirable interference by microbial inhabitants of the human gut with metabolism of the cardiac drug digoxin give rise to strategies for alleviating drug inactivation

# Directly connect your key terms to create an efficient title.

## Key nouns

- Human gut microbes
- Drug

## Key verbs

- Prediction (of interference)
- Interfering (microbes, with drug)
- Alleviating (interference)

Predicting  
+  
alleviating...

...drug  
interference...

...by human  
gut  
microbiome



# Avoid novelty claims.

- Unless you've read every paper, you don't really know if you're the first to discover something.
- A surprising result: unanticipated, or against common dogma, but not unprecedented
- Appropriately qualified, there are certain "firsts" you do know...

# A Novel Coronavirus Associated with Severe Acute Respiratory Syndrome

None of the previously described respiratory pathogens were consistently identified. However, a **novel** coronavirus was isolated from patients who met the case definition of SARS.

(assumption: dataset of previously described respiratory pathogens is complete)

# Sum-up

- Identify your research question & answer.
- State the answer.
- Be brief.
- Be quantitative.
- Focus on findings, not methods.

# Exercise: Draft your Mod 1 Abstract (and Title, if you have time!)

