MIT SCHOOL OF ENGINEERING

COMMUNICATION LAB

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

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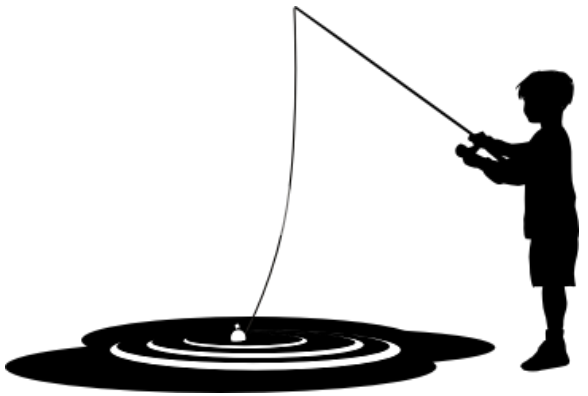
Abstracts and Titles: why do they matter?

Keyword indexing	Help your audience find your paper
First judgments	Hook them



Abstract & title must appeal to a broad audience.

- Scientists in your field
- Scientists outside your field
- Editors, reviewers
- Students
- Doctors
- Policymakers
- …

Abstracts and titles are written last,

yet read first.

What types of information do you see in this 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[1], Parrish M[2], Tay IJ[2], Li N[1], Ackerman S[2], He F[3], Kwang J[3], Chow VT[1], Engelward BP[4].

⊕ **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_2O_2, 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_2O_2, greatly suppresses S. pneumoniae-induced DNA damage and apoptosis. Importantly, S. pneumoniae induces DSBs in the lungs of animals with acute pneumonia, and H_2O_2 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.

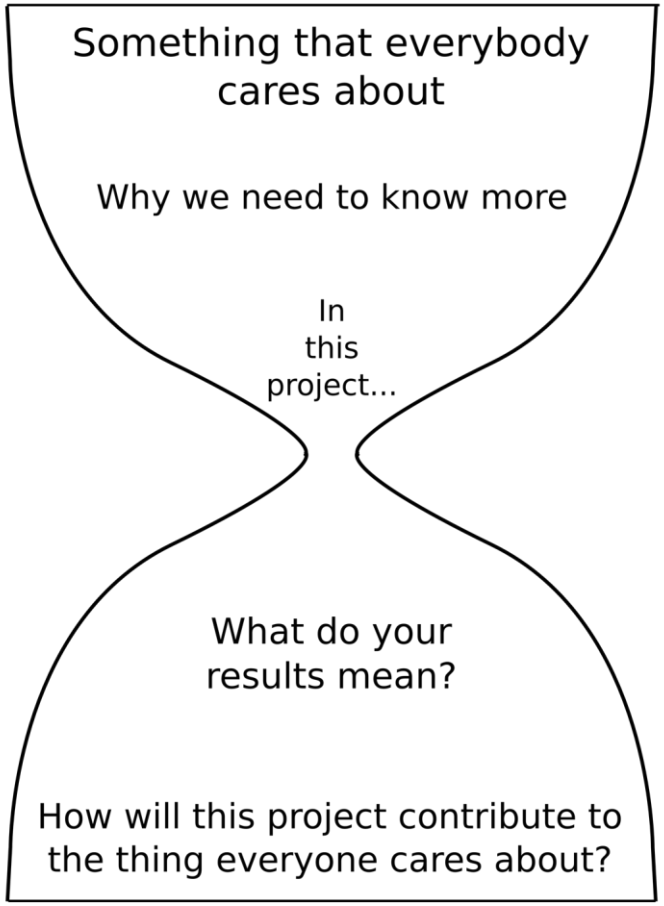
Here, we show… *[6 sentences]*

- 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_2O_2, 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_2O_2, greatly suppresses S. pneumoniae-induced DNA damage and apoptosis.
- S. pneumoniae induces DSBs in the lungs of animals with acute pneumonia, and H_2O_2 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.

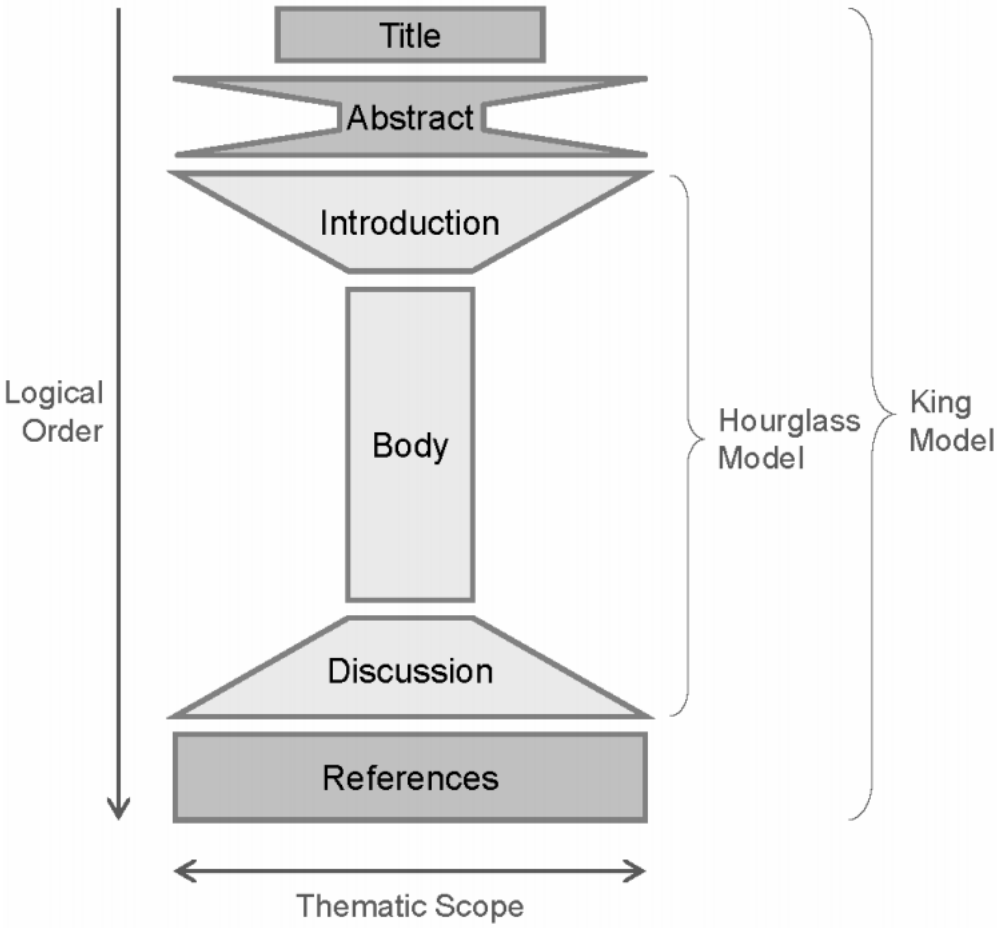


An effective abstract is an hourglass-shaped message.

General Background	Something everyone in your audience cares about.
Specific Background	Zoom in from General Background to the thing you did.
Knowledge Gap	Question that will be answered by your research. Problem, phenomenon that is not understood.
HERE WE SHOW	Conclusion, answer to the Knowledge Gap.
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?

Preview: 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



http://dbis.rwth-aachen.de/~derntl/papers

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 strategies for effective writing

Word choice	Simple, context-appropriate, quantitative
Sentence structure	Simple, active, most important information comes first
Transition phrases	Establish rationale and logical flow
Concision	Cut often

Choose the right word for the context.

- The response was blocked by phentolamine but was not *(affected, effected)* by propanolol.
- 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.

Choose the right word for the context.

- The response was blocked by phentolamine but was not *affected* by propanolol.
- The digoxin *concentration* was increased from 0.5 to 2.5 ng/ml.
- At frequent *intervals* we measured pH, P_{O_2} and P_{CO_2} in arterial blood, and during each *period* of study we measured pulmonary blood flow two or three times.
- 75 percent nitrous oxide *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

Construct strong sentences.

Important info comes first	• Make the topic the subject. *The patient showed no change in symptoms.* *The patient's symptoms did not change.*
Simplify	• Talk about one thing at a time. • Avoid long noun clusters. • Keep related words together (e.g., subject + verb). • Use parallelism. *The enzyme neutralizes oxidative damage and has an apoptosis-suppressing effect.* *The enzyme neutralizes oxidative damage and suppresses apoptosis.*
Make it active	• Use the active voice. *More protein was transported by mutant cells.* *Mutant cells transported more protein.* • Put the action in the verb. *An increase in heart rate occurred.* *Heart rate increased.*

Use transition statements to show logical relationships between sentences and paragraphs.

As a result
Given this observation
According to this theory
In order to accomplish this

Cut, cut, cut.

Shorter sentences are clearer.

paragraphs

papers

Titles: Communicate what you found, and so what.

"What" and "so what" vary with audience.

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 nouns and verbs.

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 is…
  - 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

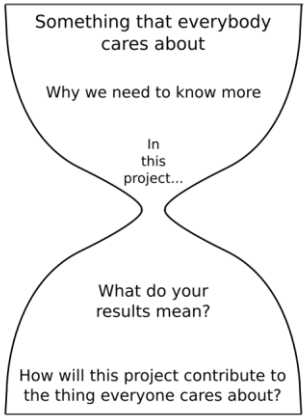
None of the previously described respiratory pathogens were consistently identified.

However, a **novel** coronavirus was isolated from patients who met the case definition of SARS.

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

Take-homes

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



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