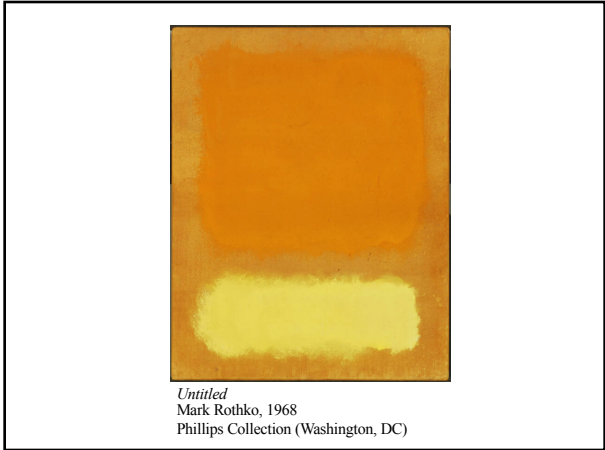


MIT **BE** | Communication Lab
 BIOLOGICAL ENGINEERING

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

Sean Clarke + Diana Chien
 BE Communication Lab Instructors

Helping you communicate effectively.
be.mit.edu/communicationlab



1) Abstracts + Titles:
 Why do they matter?

Attracting your audience: first judgment

Influencing whether someone will read or cite your paper

Indexing – Will readers find your paper?

Abstract + title must appeal to a broad audience.

- People in your field
- Editors, reviewers
- Researchers outside your field
- Students
- Reporters
- Anyone looking for information

Abstracts and titles are written *last*, yet read *first*.

INTRO
 RESULTS
 figure 1
 figure 2a,b,c
 figure 3
 figure 7
 table 1
 table 2
 DISCUSSION
 METHODS

An example abstract from the Engelward Lab

Proc. Natl. Acad. Sci. U.S.A., 2015, Jun 30;112(26):E5421-30. doi: 10.1073/pnas.1424144112. Epub 2015 Jun 15.

Streptococcus pneumoniae secretes hydrogen peroxide leading to DNA damage and apoptosis in lung cells.
 Rai P¹, Parnish MP¹, Tay LP¹, Liu N¹, Ackerman S¹, Liu F¹, Kwana J¹, Chow VT¹, Engelward RP¹.

Author information

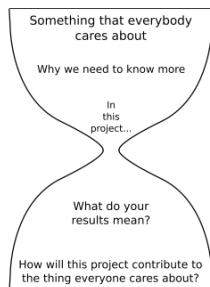
Abstract
 Streptococcus pneumoniae is a leading cause of pneumonia and one of the most common causes of death globally. The impact of S. pneumoniae on host molecular processes that lead to detrimental pulmonary consequences is not fully understood. Here, we show that S. pneumoniae induces toxic DNA double-strand 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 H2O2, 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 H2O2, greatly suppresses S. pneumoniae-induced DNA damage and apoptosis. Importantly, S. pneumoniae induces DSBs in the lungs of animals with acute pneumonia, and H2O2 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 H₂O₂, 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 H₂O₂, greatly suppresses *S. pneumoniae*-induced DNA damage and apoptosis.
 - *S. pneumoniae* induces DSBs in the lungs of animals with acute pneumonia, and H₂O₂ 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.



Here are the 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 of Methods/Results.
- Implication, Significance** So what? What do your results mean for the thing everyone cares about? Next steps?

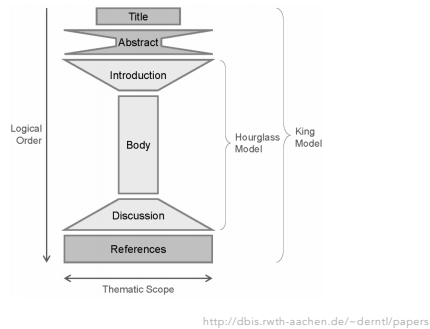
Abstracts are a preview of the shape of a full paper.

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

2) Quick writing improvements

- 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 propanolol.
- The digoxin (*amount, concentration, content, level*) was increased from 0.5 to 2.5 ng/ml.
- At frequent (*intervals, periods*) we measured pH, PO₂ and PCO₂ 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, PO₂ and PCO₂ 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

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 (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...

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: the dataset of previously described respiratory pathogens is complete)

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 your reasoning explicit.

3) Titles

What did you find? So what?

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

vs.

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

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

Predicting
+
alleviating...

...drug
interference...

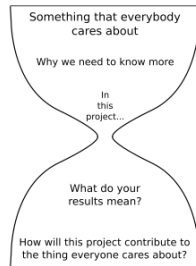
...by human
gut
microbiome

Take-homes:

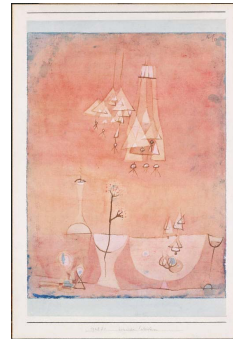
- Identify your research question & answer.
- Be **brief**.
- Be **quantitative**.
- Focus on **findings**, not methods.



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



To the lab!



Botanical Laboratory
1928, Paul Klee (1879-1940)



Succession
1935
Wassily Kandinsky 1866-1944

Workshop structure

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