MIT SCHOOL OF ENGINEERING
COMMUNICATION LAB

20.109 Communication Workshop 4: Manuscript Architecture

Diana Chien, BE Communication Lab Instructor

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mitcommlab.mit.edu/be

Overview

Strategy

- A paper has multiple audiences & publishing goals

Process

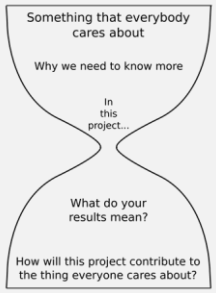
1. Crafting narrative
2. Guidelines for success (Results, Discussion)

There are no explicit models for successful papers.

If you read a paper you like, collect it!
Analyze what makes it especially clear & compelling.

Today's training unites elements from many of our past trainings.

ABSTRACTS



TITLES

what you found
+
why it matters

FIGURES

figure = message + data

maximize signal-to-noise

PRESENTATIONS

link each component of your narrative back to the research question

The goal of a paper is to prove that you did or found something new.

Claim Priority

establish where you fit in the context of previous work

credible

significant

novel

Share

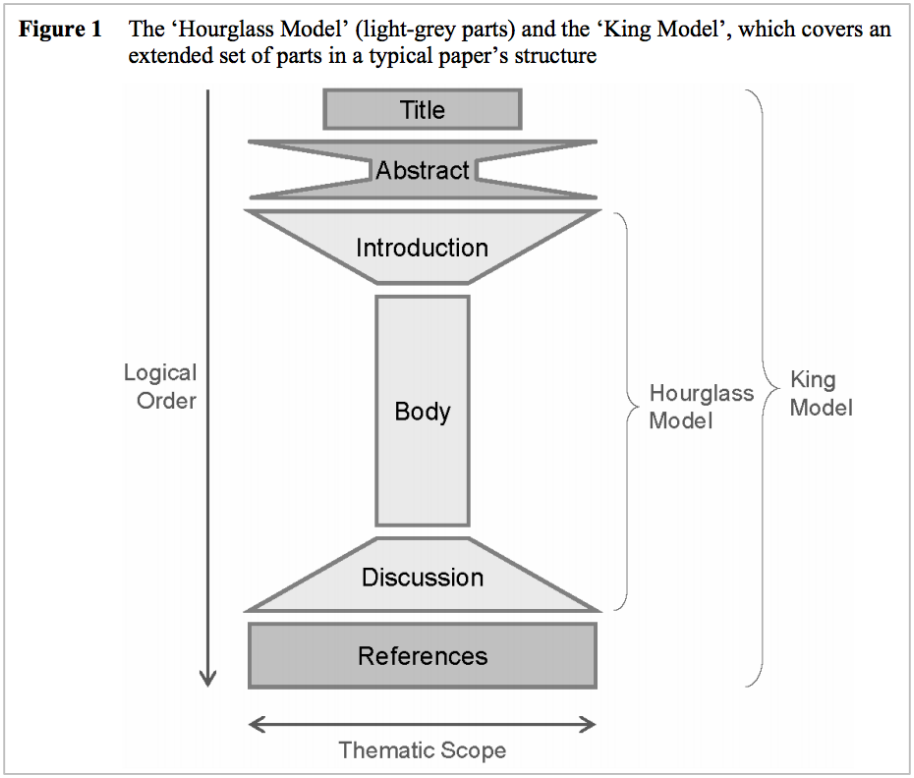
clear

accurate

reproducible

compelling narrative

Papers are often pictured as linear…



…yet are both read and written nonlinearly.

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

A research paper must speak to both insiders & outsiders.

Field experts

Other scientists

Clinicians

Public health

Policy

Education

Insiders and outsiders read different sections.

	I	O
Title & Abstract	■	■
Introduction		■
Methods	■	
Figures & tables	■	
Results		■
Discussion		■

Sections serve different publishing goals.

	I	O	Claim Priority	Share
Title & Abstract	■	■		
Introduction		■		
Methods	■			
Figures & tables	■			
Results		■		
Discussion		■		

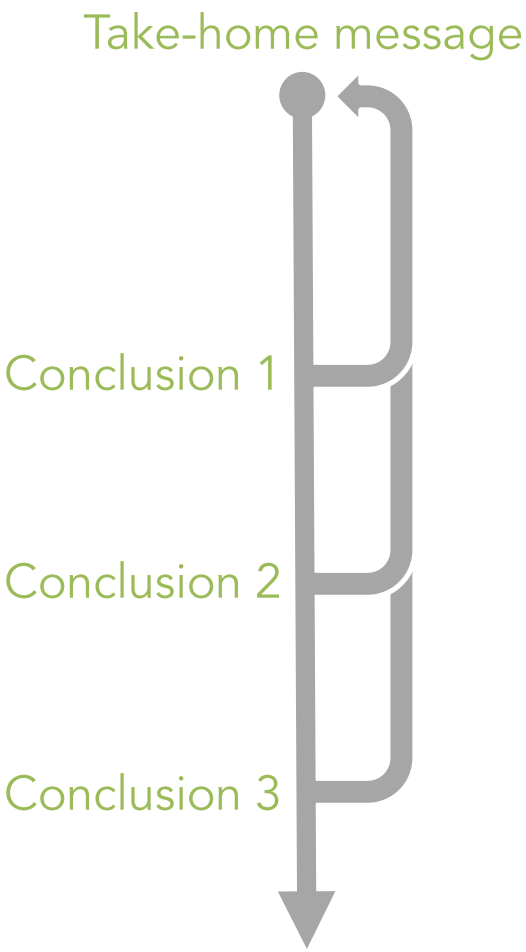
Writing process

Papers are written out of order.

1. Authors
2. Figures, tables, legends
3. Methods
4. Results
5. Introduction
6. Discussion
7. Acknowledgments
8. References
9. Abstract and Title

Create a single storyline.

1. Identify your **take-home message**; everything else leads to it.

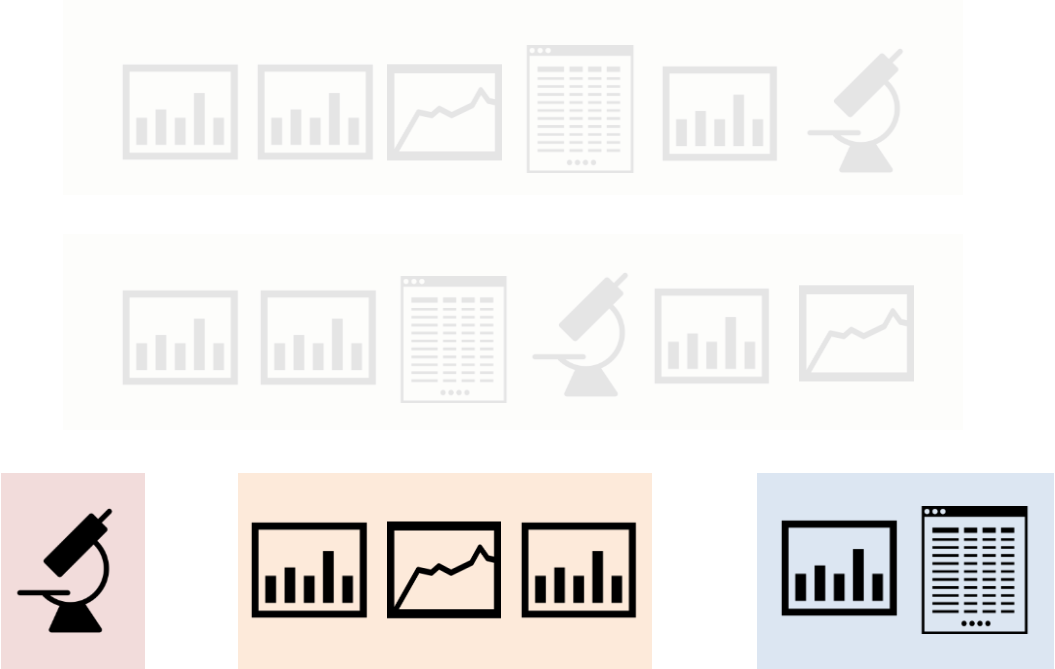


To find your story, organize your Figures.

2. Rearrange until you've created a **logical series** of conclusions.

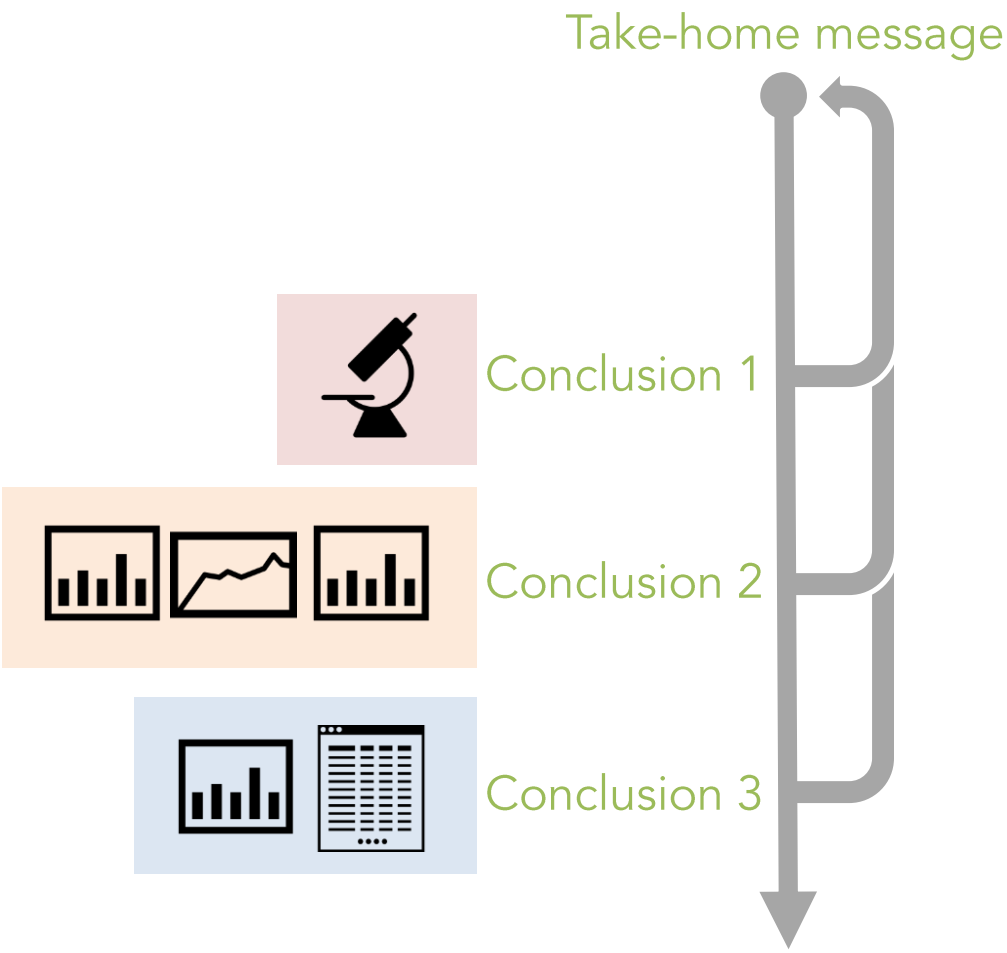
To find your story, organize your Figures.

3. Identify **modules** that correspond to **conclusions**.



To find your story, organize your Figures.

3. Identify **modules** that correspond to **conclusions**.
   Conclusion = title of a subsection.



Create a narrative by linking together modules that lead back to the take-home message.

We identified a druggable synthetic lethal interaction between DNA-PKCs and MSH3.

Activity Profile of KU60648 in a Large Panel of Genomically Annotated Cancer Cell Lines
Drug screen results
Functional clustering of mutations …

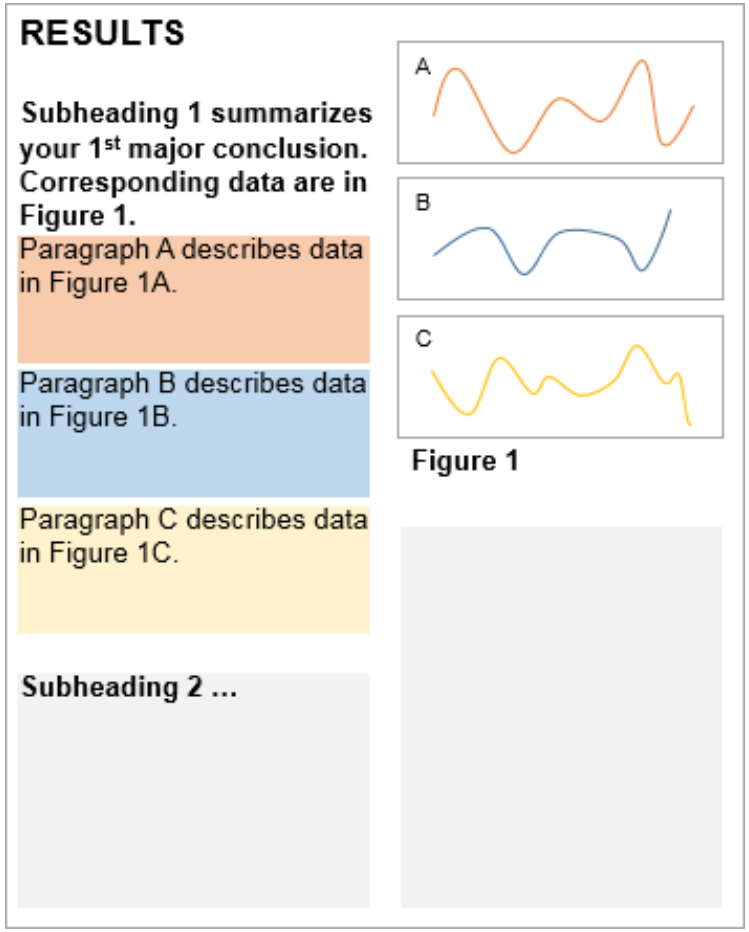
DNA-PKcs Inhibition Induces Apoptosis in MSH3 -Mutant Cells
Flow cytometry showing apoptosis
Morphology of DNA-PKcs knockout cells…

Genetic Validation of the Apparent Synthetic Lethality
Protein immunofluorescence of MSH3 mutants…

Dietlein et al., 2014

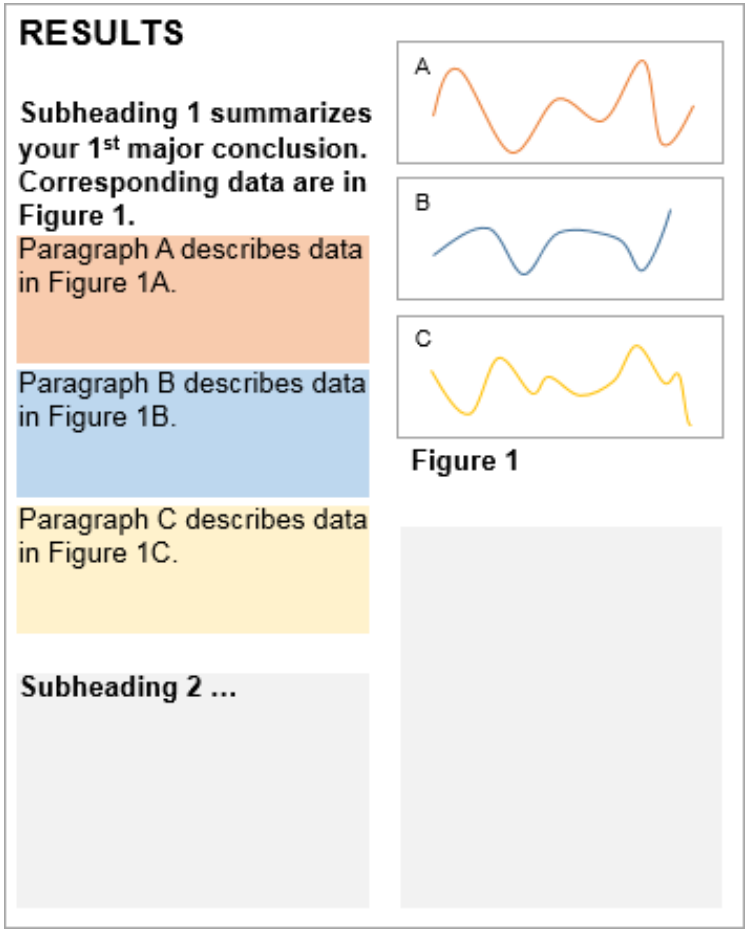
Use parallelism: Put all of your content in the same order.

Data || Results || Discussion || Methods

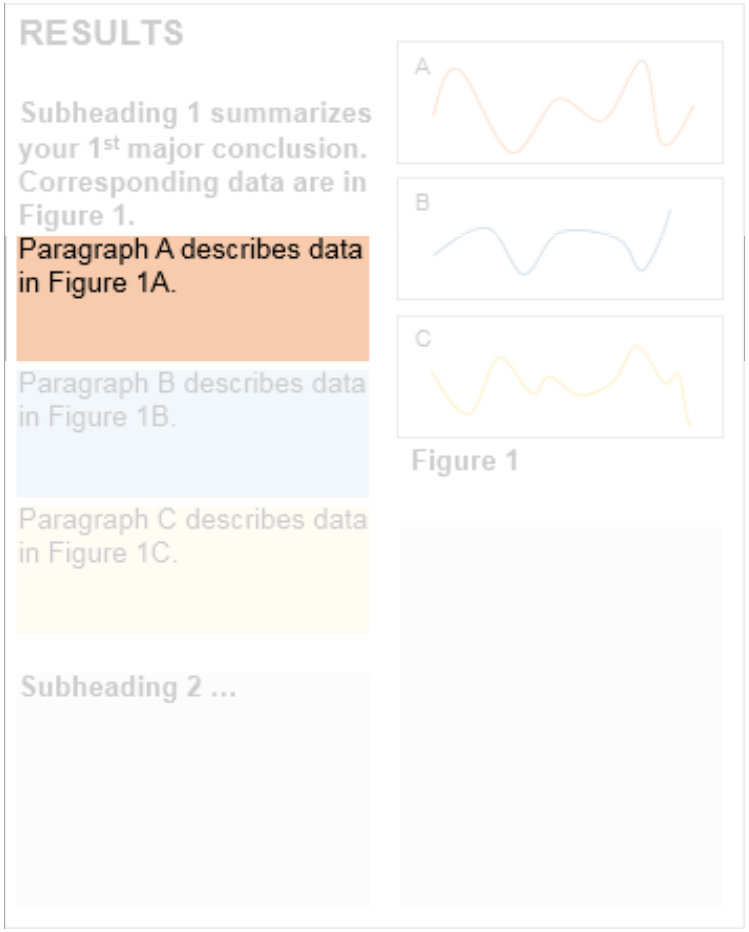


Paper structure: Results + Discussion

Results = rationale + data + conclusions



Results = rationale + data + conclusions

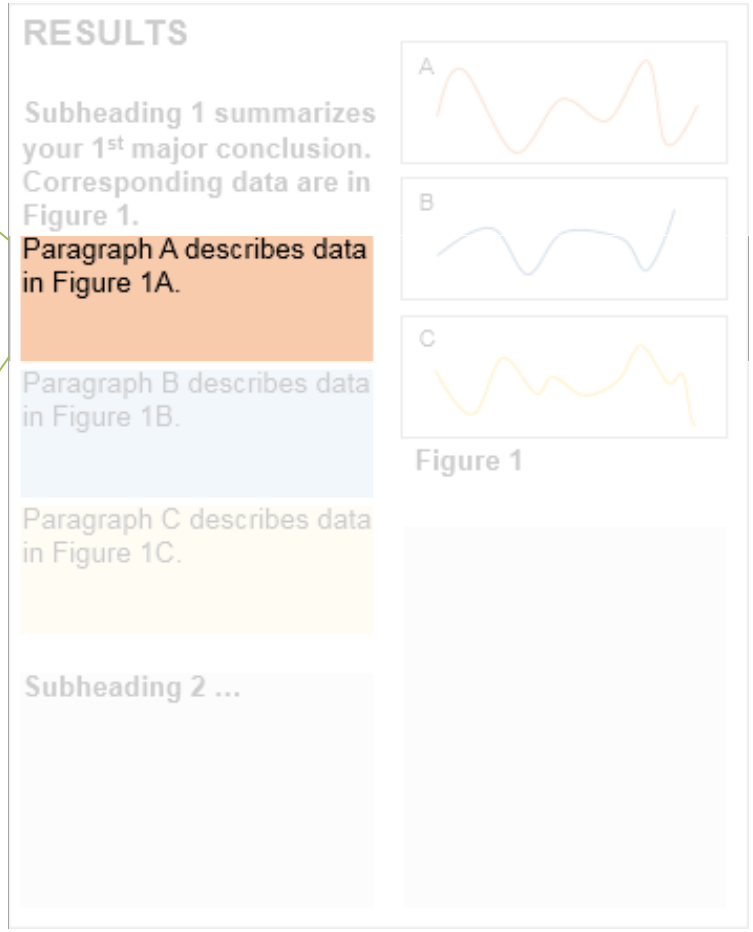


Results = rationale + data + conclusions

In order to determine *X*, *Y* was performed, showing *Z* major results.

Data + conclusions
- pro, then con
- most to least important
- experiment vs. control

Transition sentence
- re-summarize findings
- justify movement to next experiment or hypothesis



Results: Show minimal essential data.

Maximize signal-to-noise.

Include

- The experiment or dataset that is the strongest proof of your conclusion.

- Parts of your chosen dataset might contradict your main conclusion, or support 1 claim but not another.

  Be clear and honest when describing any such contradictions, especially if they might reflect limitations that your reader should know about when evaluating major claims, e.g., method shortcomings

Results: Show minimal essential data.

Maximize signal-to-noise.

Exclude

(or put in Supplementary Information)

Experiments or datasets that…

- Also support your conclusion but are not the strongest proof

  method is less validated
  data are less statistically significant
  data are less intuitive to interpret

- Were run to validate methods

- Were run to rule out alternative hypotheses

Results: Follow the Herskowitz Rule

amount of **time** spent describing an individual result

$\propto$

importance of that result to the paper's main conclusion

Ira Herskowitz, UCSF

Speculation belongs in Discussion, not Results.

Summary of paper's main conclusion

Comparison with previous results or theories

Scientific or engineering implications of this work

Paper's limitations in scope

Forward-looking statement

Speculation belongs in Discussion, not Results.

Summary of paper's main conclusion	1 or 2 sentences
Comparison with previous results or theories	
Scientific or engineering implications of this work	No more than 1 degree of speculation
Paper's limitations in scope	
Forward-looking statement	

A successful Discussion can be useful to both experts and non-experts.

Summary of paper's main conclusion

Comparison with previous results or theories

Expert asks:
How do you account for results that contradict the rest of the field?

Scientific or engineering implications of this work

Paper's limitations in scope

Expert asks:
How do you explain confusing or complicated results?

Forward-looking statement

Use parallelism:
Put all of your content in the same order.

Data || Results || Discussion || Methods

Methods		Results
Optimization of algorithm parameters	⟷	Algorithm performs best when using parameters X and Y.
Physical characterization of tissue samples	⟷	Microscopy reveals significant tissue damage due to Mutation Z.

Again, use subheadings that help your reader find the Methods that match the Results.

Activity: Evaluate an example paper.

Zetsche et al., 2015.

1. **Compare Results, Figures, and Methods.**
   - Do Results + Figures tell a logical story?
   - Is it easy to find the information that you need in order to understand the story?
   - What do you think of the subheadings and Figure titles?

2. **Assess the Results paragraphs.**
   - Is rationale made clear?
   - What about conclusions?

3. **Assess Introduction and Discussion.**
   - Does the stated impact seem justified by the actual findings?
   - Is the speculation reasonable in scope?