

# Notes on the Research article!

- Due date: **Mon, April 29 @ 10pm**
- Individual assignment
- No revision
  
- Text: Word doc or PDF
- Figures: in Word doc or PPTX
  
- Written in paragraphs (no more bullet points)



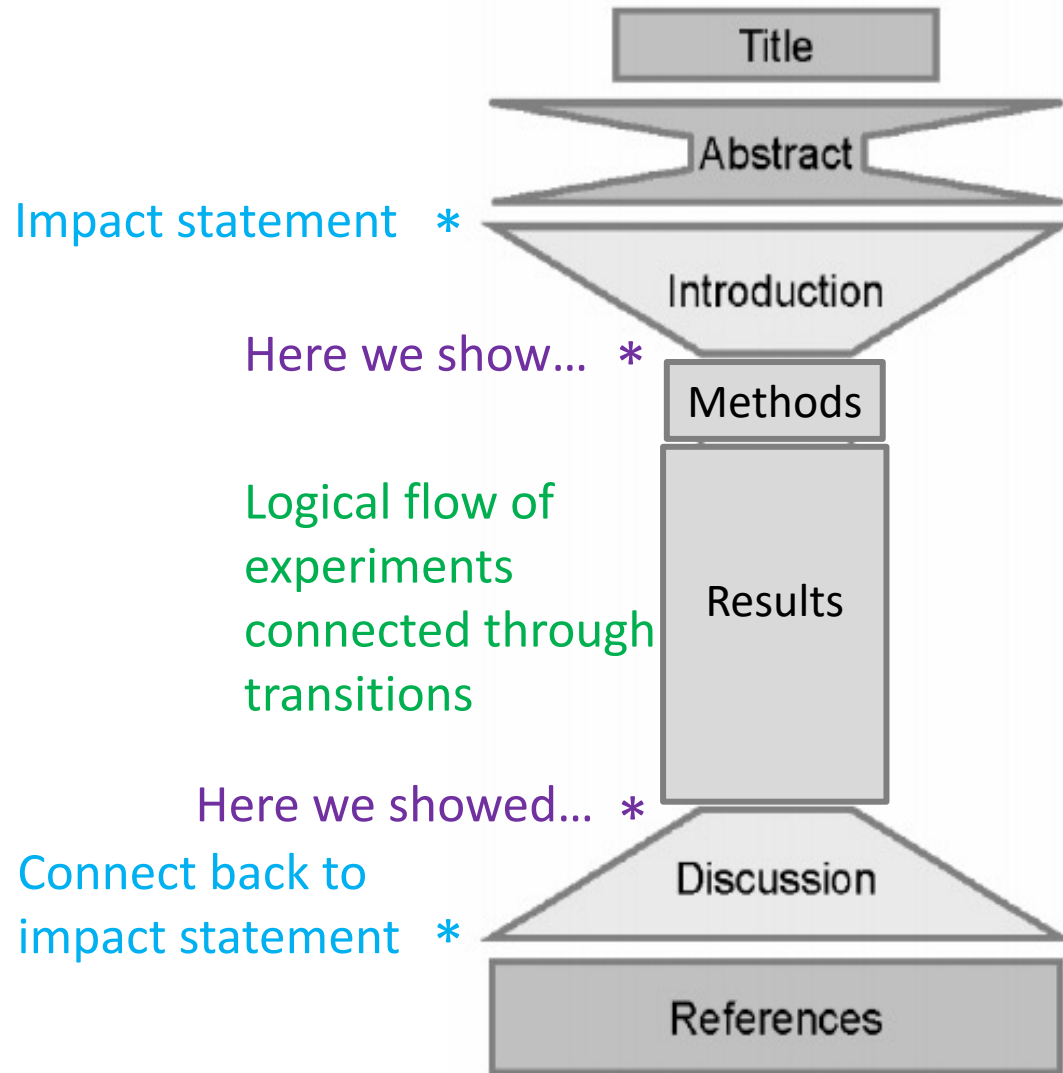
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# Overall suggested breakdown of RA components



- Title & Abstract (10%)
  - First page
- Introduction (10%)
  - ~2-3 pages
- Methods (20%)
  - ~2-4 pages
- Results w/ Figures & Captions (50%)
  - ~4-5 pages
- Discussion (10%)
  - ~2-3 pages
- References
  - Last page(s)

# The Introduction

# Structure of the Introduction

- Impact statement
  - Why is your research important?
- Specific background
  - Introduce topics important to understand the context of the project
    - **Such as?**
  - Narrow focus to the knowledge gap addressed in your study
  - Include citations!
- Knowledge gap
  - What remains unknown and how will your research question answer it?
  - **Include your research question!**
- Preview of your findings
  - **Here we show...**

Can be different for each writer!

Make sure the research question can be addressed by your experiments

# The Methods

# Notes on the Methods section

- Group methods in subsections with descriptive titles
  - Logical, not chronological
- Include an introductory sentence which explains purpose of method
- Methods are not protocols
  - Include the detail necessary for work to be repeated in a different lab
  - Do not need volumes or concentrations of stock solutions since these can vary
- Include genotype of any bacteria/yeast strains
- Include sequences of any primers used

# Extra notes on the methods section

- Flow cytometry
  - Detection was limited to 100,000 events
- ICP-OES
  - performed at Materials Research Laboratory core at MIT
  - 3 replicates per sample
  - read time 5s
  - radial viewing mode
  - viewing height 8mm
  - report wavelengths used for analysis
- TEM
  - Preparation of grids for visualizing cadmium sulfide particles
  - performed at Materials Research Laboratory core at MIT

# The Results



# How do you write about the results?

- Your goal was not to create a fully functional bioremediation system that was ready for deployment into the environment
- Module called “protein engineering”
- Everything you learned about how your peptides affected the capture of cadmium sulfide particles is valuable
  - Not every experiment has to work perfectly, but they do build on each other to show an overall picture of the peptide effect

# How do you write about results: in figures/captions?

## Figure

- **Organize figures logically**
- Use figure subpanels as needed
- Limit text on the image, move extra details / explanation to the caption
- Use appropriately sized images

## Caption

- Include title that is take-home message
- Include introductory sentence at start of caption if you have multiple panels
- Ensure caption has information needed to "read" the figure
  - information about visualization, statistics, replicates, etc...
  - no interpretation

# How do you write about results: in the text?

- State the goal / intent / purpose of experiment in the first sentence
- What you did: experiments, variables, controls used
- Describe the results you show quantitatively when appropriate
  - Not "higher or lower"
- When you quantitatively describe your result, refer to the figure in the text (Figure 1a).
- What did you do next: transition to next experiment

Where might you put your rationale for peptide selection?

What are the 6xG and 2xGCC controls?

# What figures will be included in the Research Article?

1.

2.

3.

4.

5.

# Overview Schematic

- Visually represent the key concepts of the project

# Cloning figure

- Sequencing data
  - Chromatograph or Sequence

# Flow Cytometry figure

- Graph of mean FITC channel signal for -/+ induction for the following groups:
  - 6xG
  - 2xGCC
  - Your team
- Error bars show standard deviation
- Histogram graph(s) of binned raw data for your team -/+ induction



# ICP-OES figure

- Graph of ppm data for following groups
  - Media only
  - UT
  - EV
  - 6xG
  - 2xGCC
- Error bars show standard deviation

# Fluorimetry and TEM figure

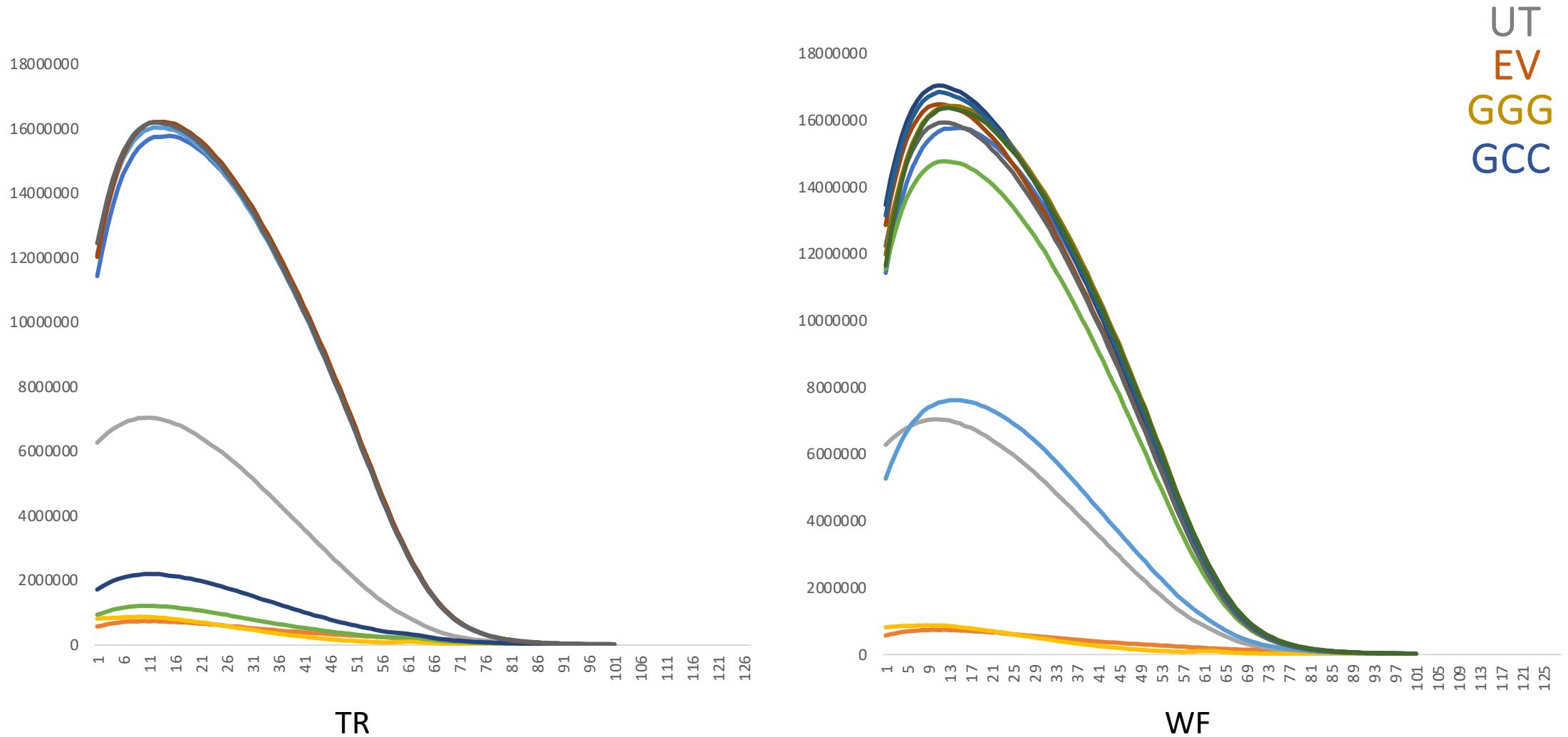
## TEM

- Representative images from dropbox folder
  - Make qualitative assessments on particle structure and uniformity
  - Use scale bars to estimate particle size

## Fluorimetry

- Table that compares:
  - Peak intensity emission value
  - Wavelength of peak intensity
- Groups:
  - UT
  - EV
  - 6xG
  - 2xGCC
  - Your team
- Use the corrected values at 425
  - Full data set there
  - Has the S1/R1 correction in data file

# Emission fluorimetry data on same axes (graph of corrected 425nm)



Results vs Discussion Section

# Reporting versus Interpreting your data

## Results (i.e. what do you see?):

- What was the goal of the experiment?
- What controls/variables were tested?
- Data from the experiment reported quantitatively
- What experiment follows based on the results you report

## Discussion (i.e. what does it mean?):

- What do you conclude from the data, and how do your results and controls support your conclusions?
- What is the context for your results?
  - Are there any unexpected results or technical issues that should be clarified?
- Overall, what does your data indicate and how would you follow up on it?

# The Discussion

# Structure of the Discussion

- Here we showed...
  - Restate major results
- Describe your conclusions from your data
  - If necessary, describe caveats of experiment and suggest improvements
  - Follow same order as in Figures/Results
- Identify unknowns and speculate (within reason)
  - Don't make huge generalizations or overreach
- Propose future experiments, identify new questions that arise
- Come back to the big picture / impact statement topic introduced in background

# Ideas for Future works:

- What are some next steps?
- What are some broader experiments?



# Remember: the Research Article will tell a story as a whole

- Introduction and Discussion should **match**
  - Preview / Review of the key findings
- Figures should be **connected** to Results
  - Figures should be referenced in Results text
  - Section headers in the results should relate to figures
- Results should be **tied together** with transitions
- Discussion should **integrate** the results together into a cohesive take-home message
- Final statement in Discussion should **relate** to impact statement from Introduction