Figure Design

20.109 Communication Workshop 1

MIT BIOLOGICAL ENGINEERING COMMUNICATION LAB

Helping you communicate effectively.
mitcommlab.mit.edu/be/
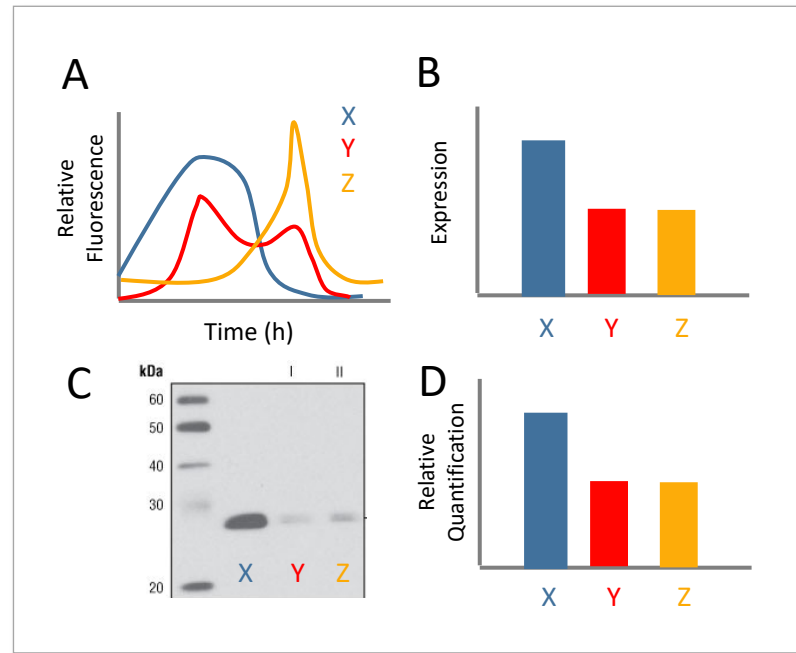
Reflect and discuss

1. What is science communication?
   What are some ways to communicate science?

2. What makes you feel that any communication has been successful?
   As a receiver? As a sender?

1. What is science communication?
What are some ways to communicate science?

There are many ways to communicate science. In this class we will focus on the tasks that are highlighted below:

Papers

Opinion Editorial Pieces

Podcasts

Videos

Journal Article Presentations

Blog posts

Twitter

Talking to friends/family

Illustrations

Posters

Pitches

Research Proposals

Review Articles

TED Talks

2. What makes you feel that any communication has been successful?

As a receiver? As a sender?

A few common metrics of "successful" communication:

You can ask questions after

You can explain it to someone else

You get a good grade

People cite your paper

It leads to more exciting science

Many of these are **actions**—understanding confers ability

Effective communication is an essential part of being a scientist

For any work to have **impact**,
it must be communicated effectively

Our approach:
- Science communication is discipline-specific
- Best way to learn science communication is to **practice and get feedback**
- Learn the basic rules and then find your own style

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Communication **workshops** are active practice opportunities

we learn best by **doing**

focus of each workshop is a **guided work session**

- Comm instructor(s) available to chat, give feedback, offer ideas
- leave with a completed communication piece that builds towards a major assignment

additional resources posted on wiki in advance

- overview of material also covered at start of workshop, review additional resources for more extended content/examples
- optional (but useful!) to review before class

Today's agenda:

Effective figure design
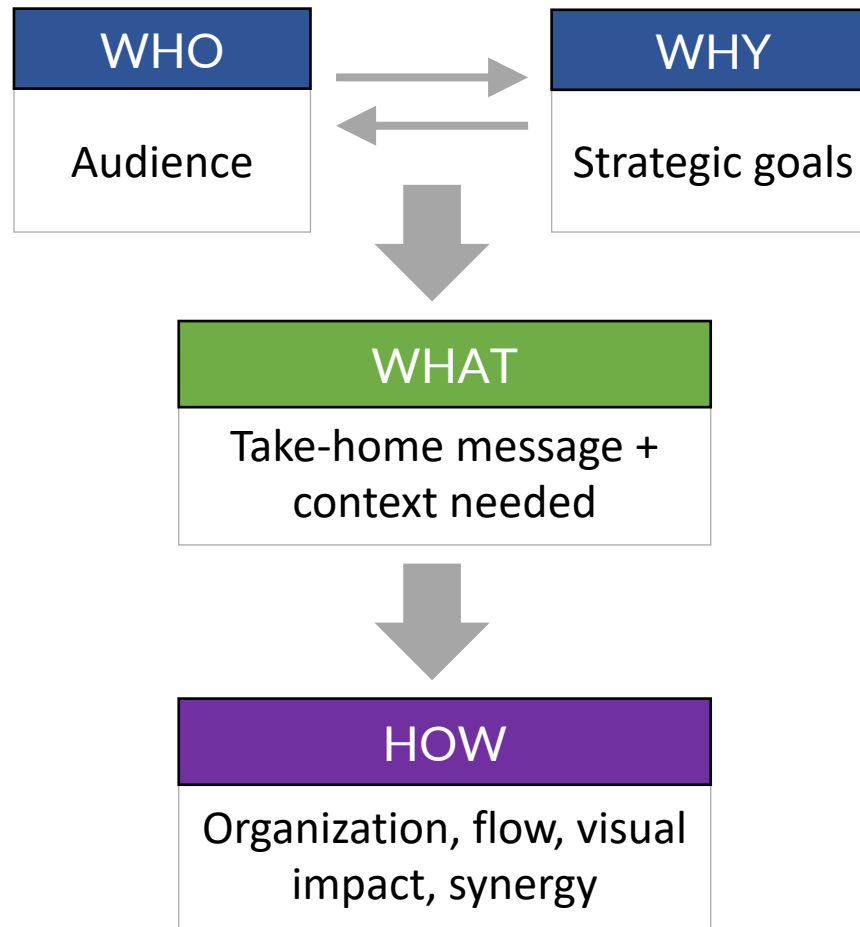
Key strategies (more resources on wiki)

Work in pairs to revise data figure draft

Leave with revised figure based on feedback

Thought experiment: what if the data were more complex?

Start thinking about captioning your data figure (next workshop!)

# We approach all communication tasks with a focus on **message**

Figures must convince your audience of your data's impact and credibility

- Expert audiences may only read:

  1. title
  2. abstract
  3. **FIGURES**

- Figures tell your story compellingly and honestly

- Figures present your "naked" data for evaluation (does the data support your paper's claim?)

There are two common kinds of figures: schematics and data figures
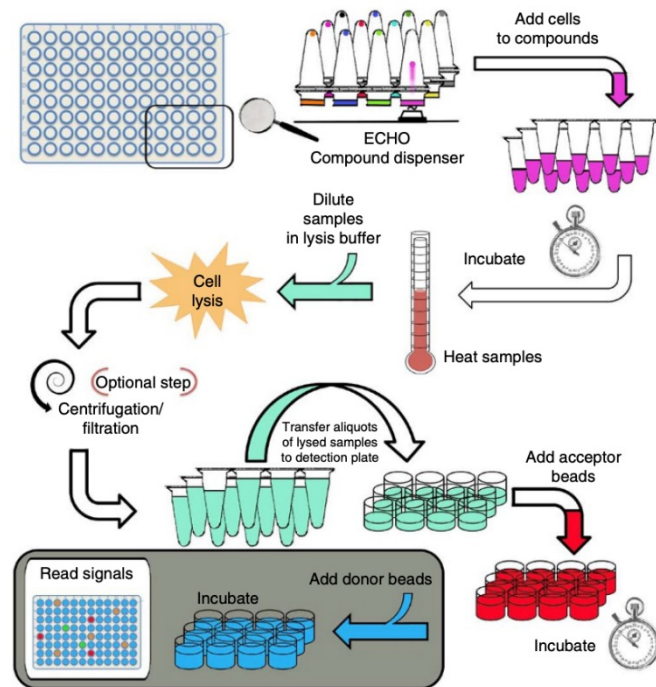
Schematic
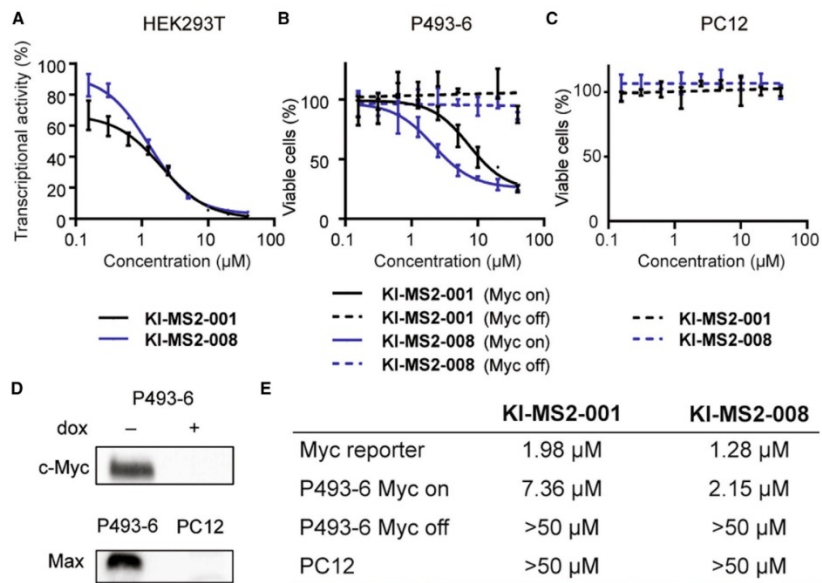
Data Figure

primary focus today

All figures have four key elements

1. Choice of data

- only data critical to the conclusion
- honest data and controls

2. Presentation choices

- type of graph or display, legends & labeling, design choices
- uncluttered elements
- allow quick evaluation of conclusions without relying on the legend or caption
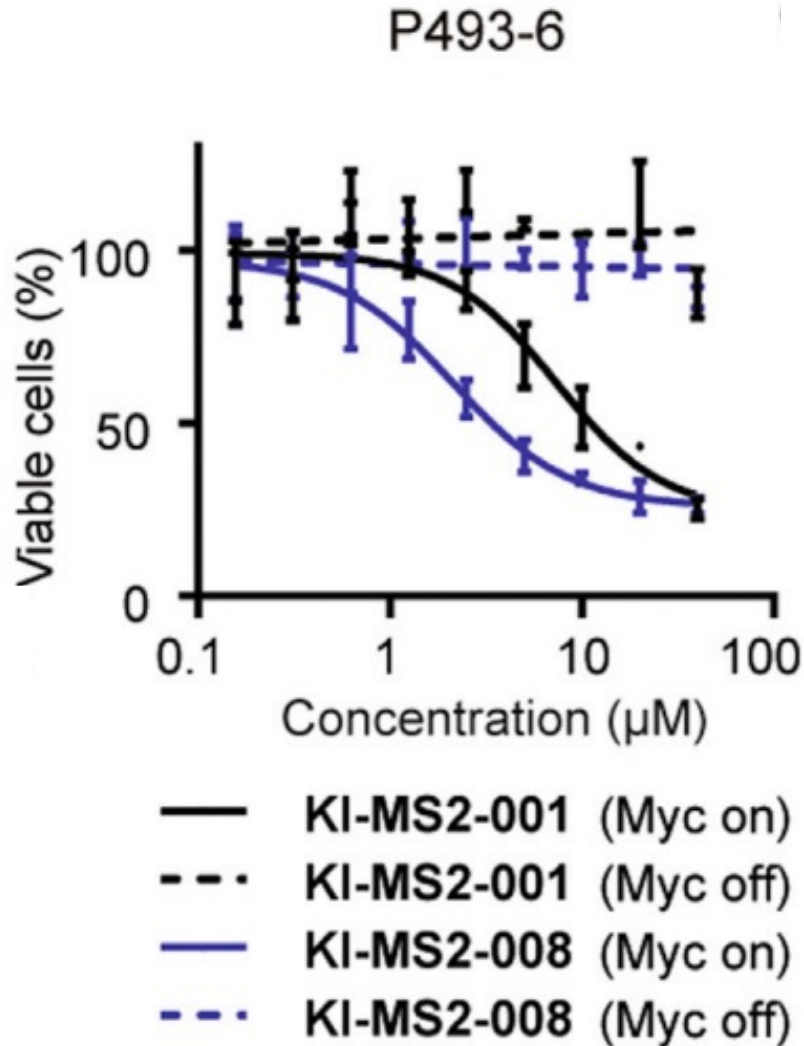
3. Title

4. Caption

A well-designed figure gets your audience to identify your message **quickly**

- I'll put some figures up on the screen

- Tell me what you think

- Things to consider:
    - what stands out to you?
    - can you understand what is happening?
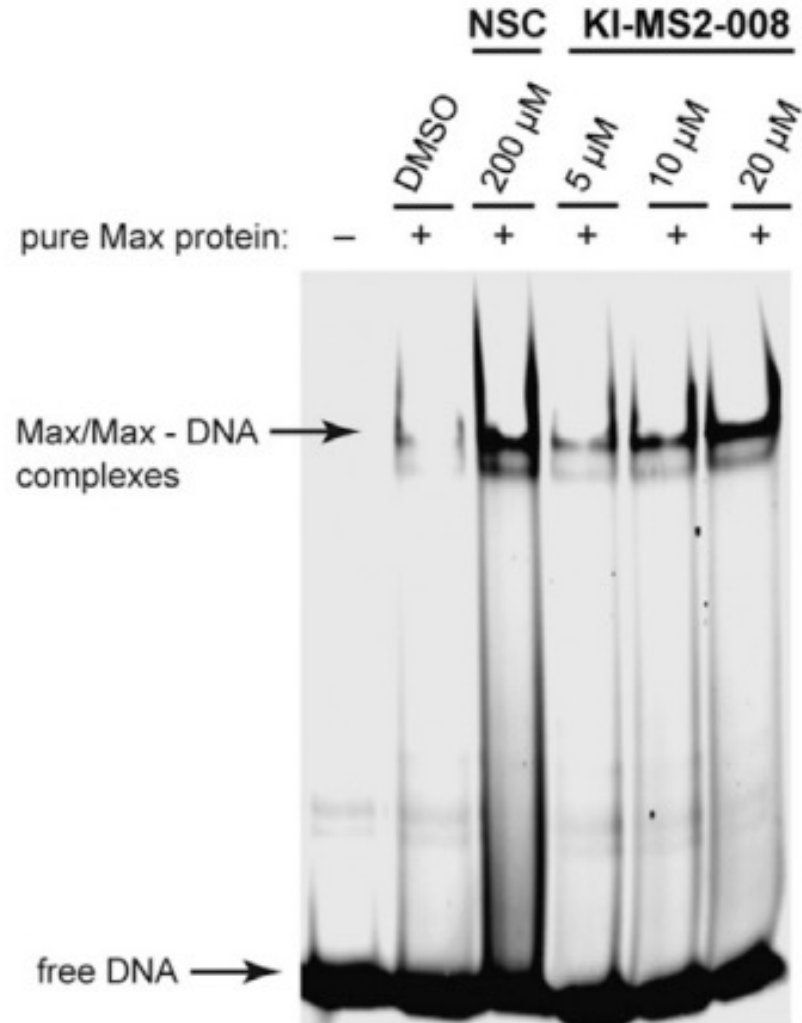   - is there anything that is distracting?

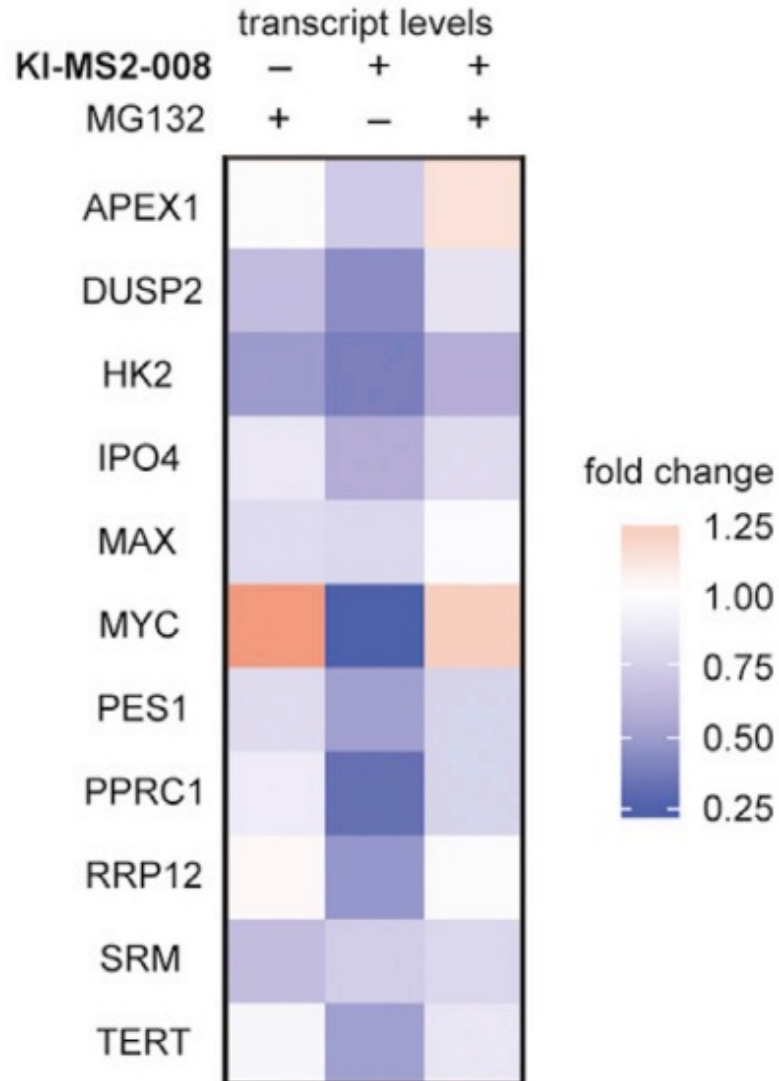# Where does your eye go with this figure?
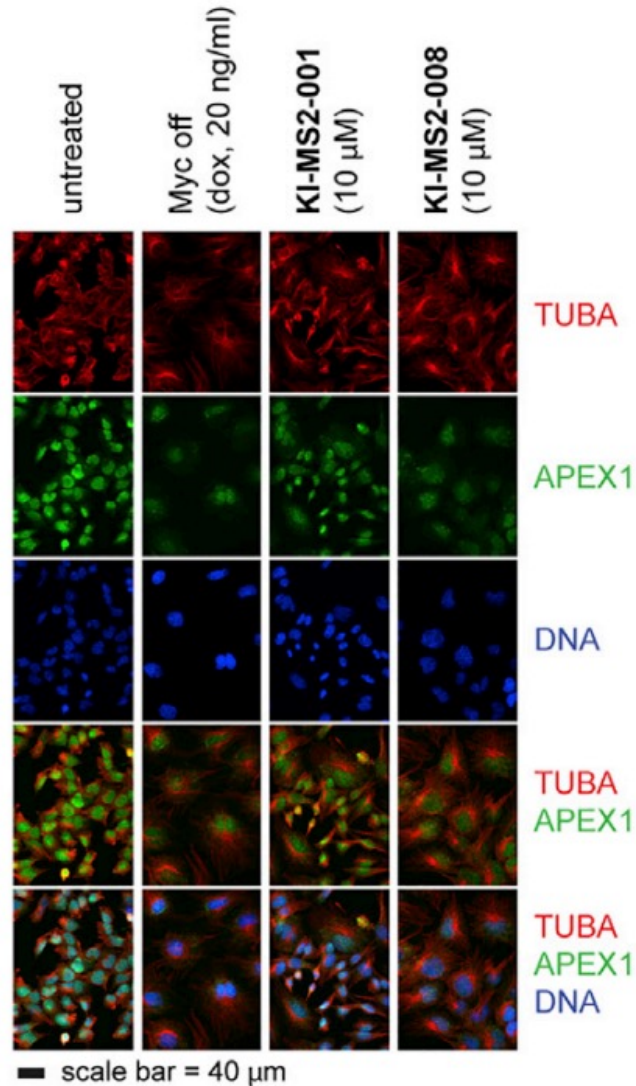
Example 1 of 4

Struntz et al, 2019

Where does your eye go with this figure?

Example 2 of 4

Where does your eye go with this figure?

Example 3 of 4

Where does your eye go with this figure?

Example 4 of 4

scale bar = 40 μm

This exercise helps you quickly test if the message of your figure comes across clearly

After you make a figure, ask someone (ideally who hasn't seen it before!) to look at it and tell you where their eye goes and what they think it means
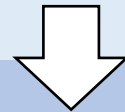
- is intended information absent?
- is unintended information present?
- are salient elements the ones you meant to emphasize?

Use this feedback to edit your figure!

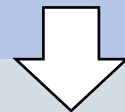# Identify your process for making figures that highlight the message you are trying to communicate

1
MESSAGE

what is the **message** of each figure?

2
DATA

what data do you **include** in each figure to convey your message?

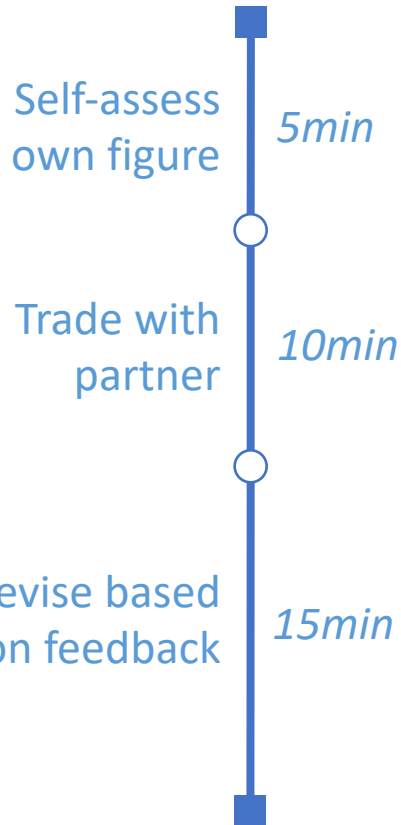how can you **present** your data to support your message?

3
DESIGN

what are some key **design choices** to think about?

Working with a partner, revise your data figure draft

Self-assess own figure — *5min*

Trade with partner — *10min*

Revise based on feedback — *15min*

What main message does your data convey?

How do your design choices support this?

Consider:

- can you quickly evaluate the conclusion <u>without</u> a caption?
- is there anything missing? extra?

How might your design choices change for a more complicated figure?

Suppose you extracted protein from a series of 10 different conditions and ran your samples on an SDS-PAGE gel. Instead of Coomassie-staining the gel, you visualized the protein X band using antibodies, resulting in the following two Western blot images:

antibody against protein X
(not specific to phosophorylation state)
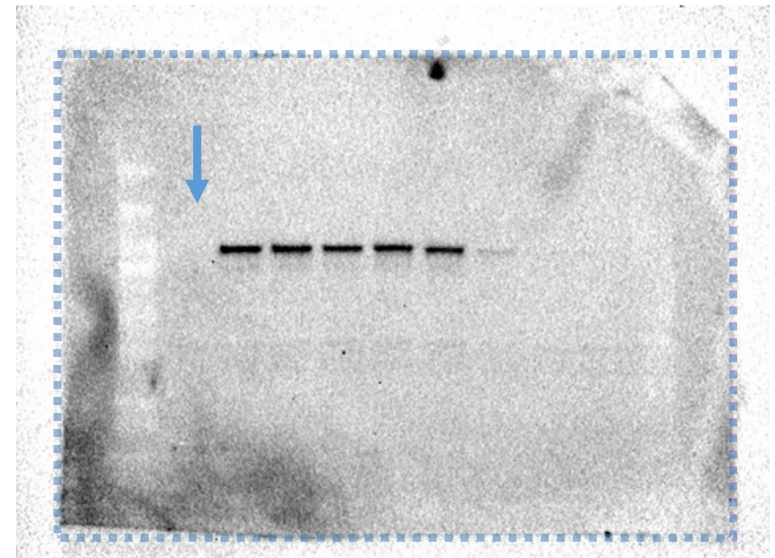
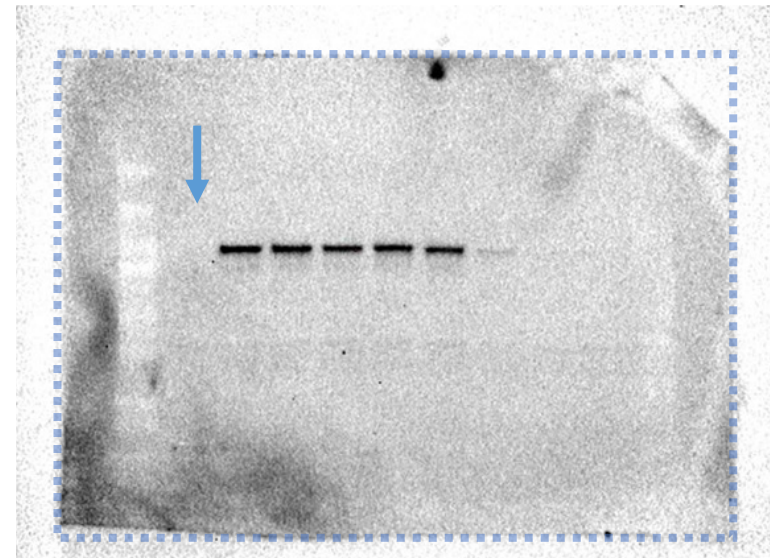antibody against phosphorylated protein X

How might your design choices change for a more complicated figure?

- what kind of information can you draw from these blots?
  how does this compare to your Coomassie-stained SDS-PAGE gel?

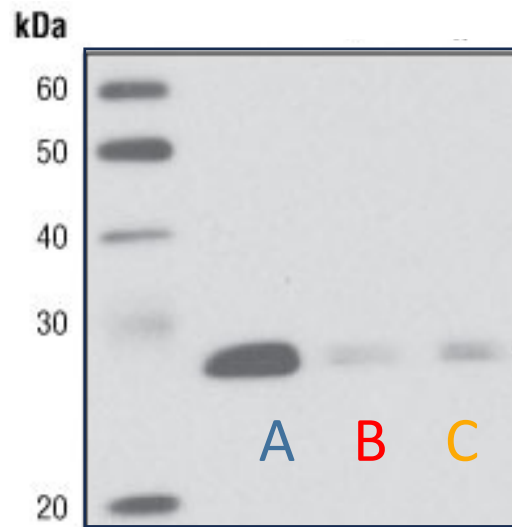- how would you choose to display these gel images differently?

antibody against protein X
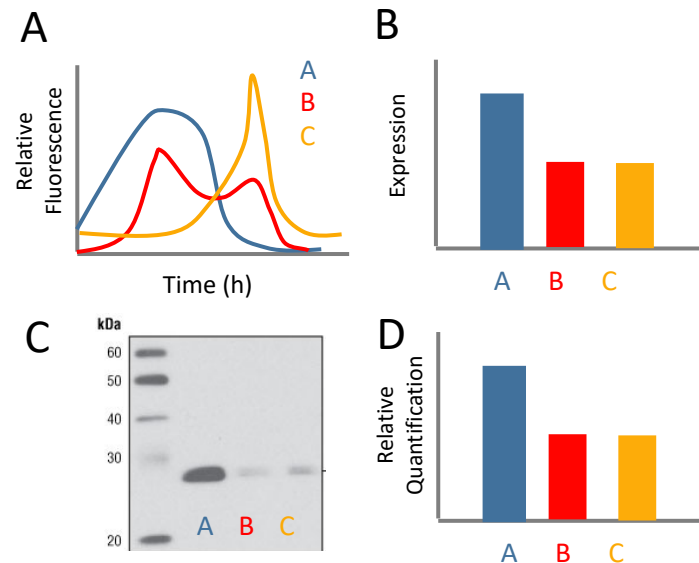(not specific to phosophorylation state)

antibody against phosphorylated protein X

All the data in a figure should support one clear message.

This could be through a single panel…

…or multiple panels that contribute to the same takeaway message

For every figure, ask yourself...

❑ Is the central message validated by the data shown?

❑ Which data are irrelevant?

❑ Are there any data/labels missing?

❑ What could be done to better highlight the most important data?

❑ Is there a better way to present the data?

❑ Do the statistics actually add anything here?

Optimize your figures with these reminders

High-level questions

- *Strategic purpose:*
  - What do you want to convey?
  - How will you and/or your audience use this figure?

- *Organizational structure:*
  - Where does this figure fit into the communication?
  - Why?

Checklist

- ❑ Choice of data
- ❑ Title/caption
  - Can the figure stand alone?
- ❑ Consistent layout
  - Fonts, spacing, colors
- ❑ Text amount and placement
- ❑ Scale, axes, tick marks
- ❑ Error analysis
- ❑ Ink-to-whitespace ratio

Next steps

- slides and additional resources posted on the wiki ("Communication" tab)
  - review to learn more about resources available to you through the BE Communication Lab

- bring a drafted title and caption for today's data figure to our next workshop
  - preview: **clarity** and **brevity** are key!

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