



The University of Texas at Austin  
Cockrell School of Engineering

August 2025

# STARTING TIPS: MAKING PRESENTATIONS (AND POSTERS)

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(Have a nice title slide)

Wang Materials Group Meeting Tutorials

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(Have a nice title slide)

# Starting tips: Making Presentations (and Posters)

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<https://wangmaterialsgroup.com/>

Professional Development Elective, Group Tutorial  
August 24, 2023

# Why bother?

Effective science involves effective communication

How will people know your work is cool  
if they cannot understand it?

# Treat every talk as a job talk

- It's a chance to show everyone what you've done!
- You never know who might be in the audience!

(I later learned the later Division Head at the Beijing Computational Science Research Center was in the audience at my first conference presentation!)

- Your talk is a representation of yourself, your group, the department, and UT Austin
- Every presentation is a networking opportunity
  - Have business cards ready – practiced more frequently in other cultures
  - Include contact information
  - Use technology to your advantage (QR codes, Twitter handles)

# Know your audience

How much background should you prepare?

How much jargon and technical detail should you use?

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Graduate students? Undergraduate students?

Field Experts and Senior Scientists?

General public?



If unsure, upper undergrad/lower graduate level is a good level to start at

Spend the time to properly motivate why the research is important-  
even if people don't understand all of the technical details of the results,  
they can at least appreciate the impacts

# Know/Set up the space

| In-person  | Zoom                   |
|--|------------------------|
| Test projector and connections                             | Test audio/visual      |
| Laser pointer, slide advancer                              | Digital pointer        |
| Room size-<br>how much to project,<br>move around the room | Breakout rooms, polls? |



<https://enterpriseproject.com/article/2020/8/zoom-tips-online-presentations>

# Tell a story

Big Picture Context:

- Why is this research important?
- What was the challenge/unknown?

How did you tackle the problem/challenge?

- Methods, approach, idea

What did you find?

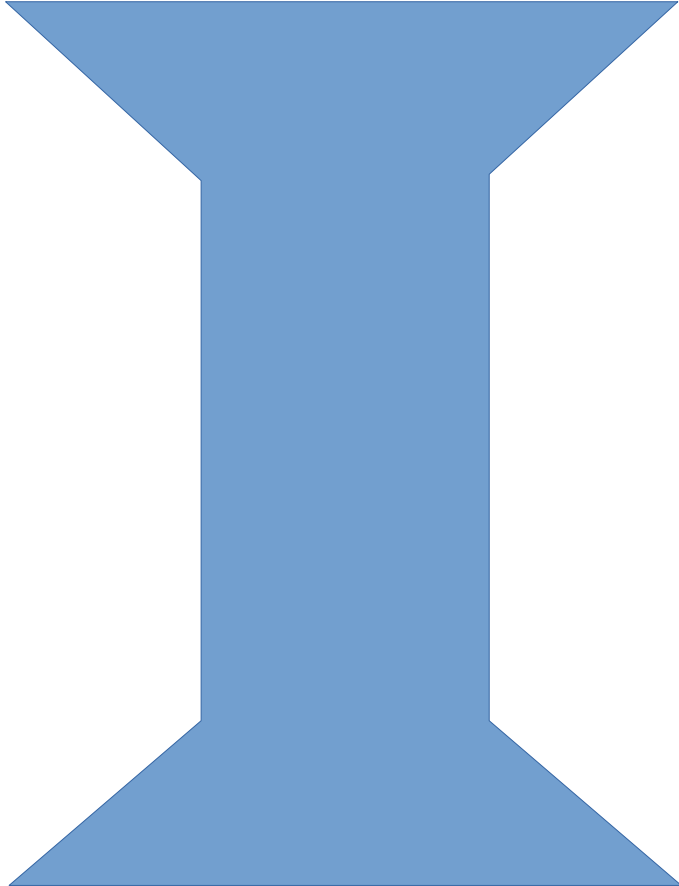
- Results and data

How are your results scientifically important?

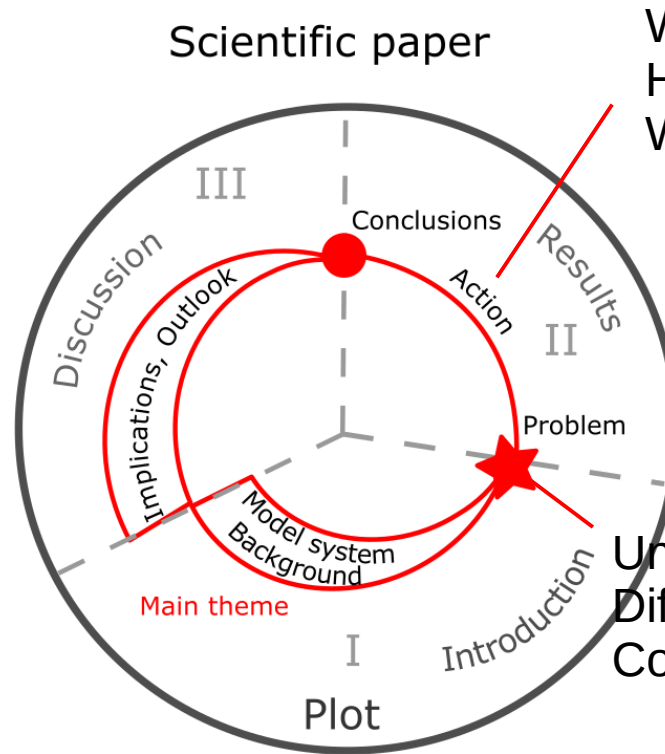
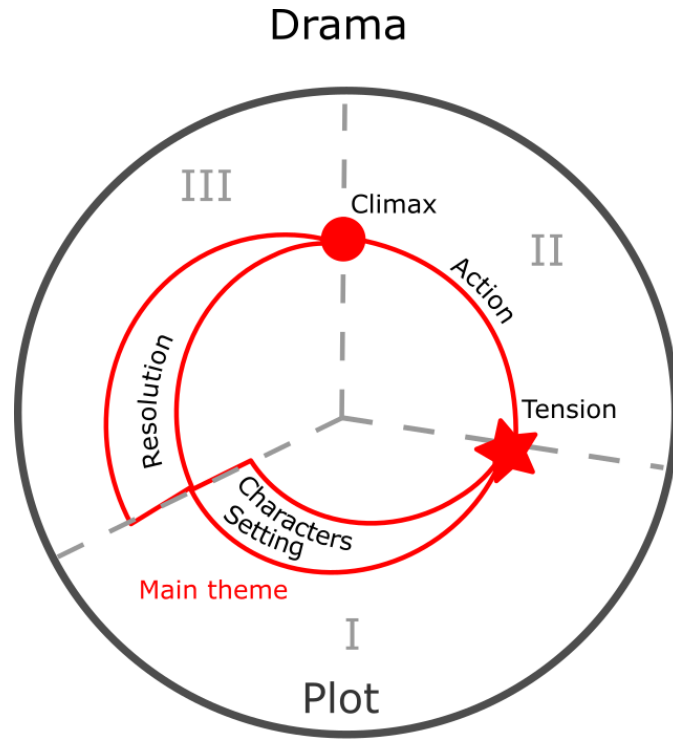
- Discussion and interpretation
- What did you learn?

Impacts and Significance

- What are the implications of your findings in your project, the field, society?
- What will you do next?



# Tell a story



What you did  
How you did it  
What did you find

Unknown  
Difficult to determine  
Controversial interpretation

© Anna Clemens

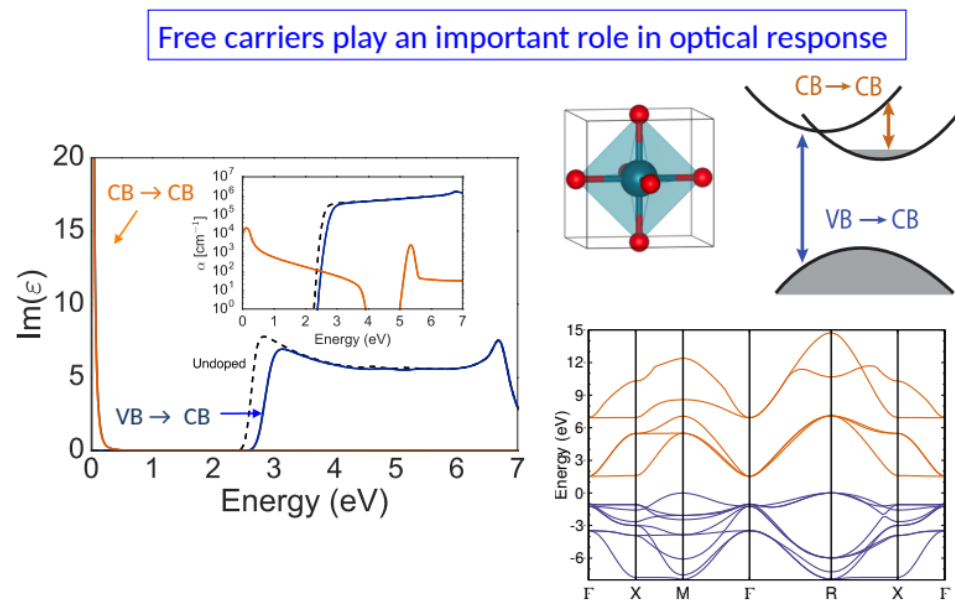
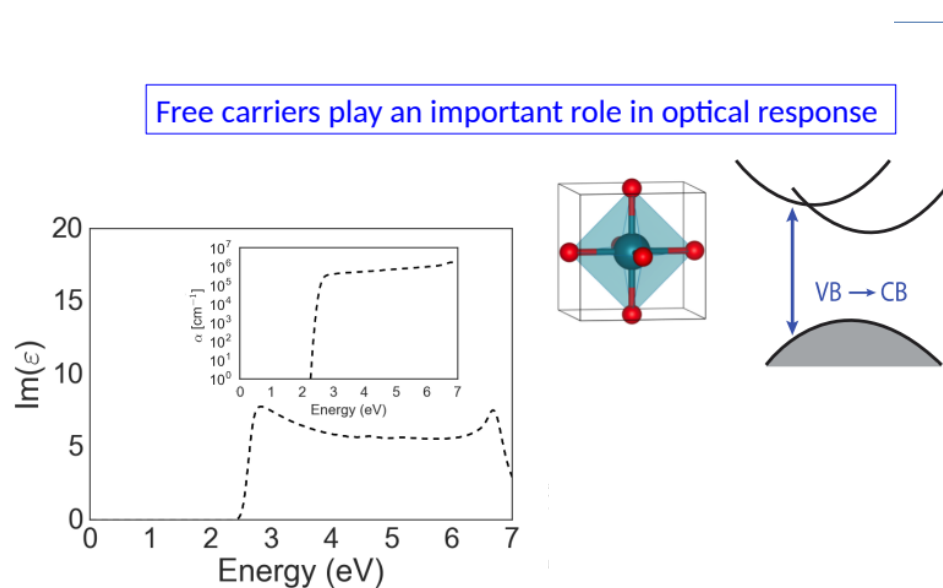


# Break up complex ideas and figures

The audience has about 20s to process and understand the plot while also listening to you

## Make it easy for them to follow the data

Use simple animations, e.g., build up a figure



# Guide the audience through *everything*

Assume the audience is pre-occupied or tired:

Tell the audience what you want them to know

“Here are the two main takeaways I want you to remember”

“If there is anything you remember from this presentation, it is...”

Signpost: “When we turn to the results...”, “In conclusion,...”

Redundancy is good: either reinforced through speech, figures, text, annotations

For the entire presentation:

what are 1-2 main points you want the audience to take away

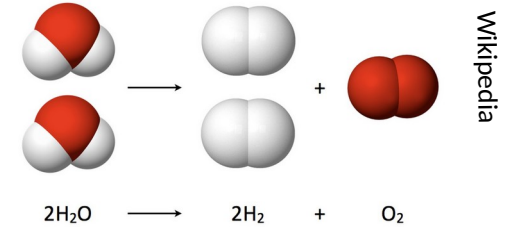
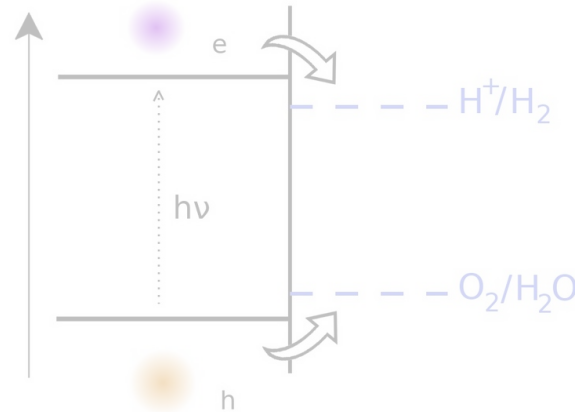
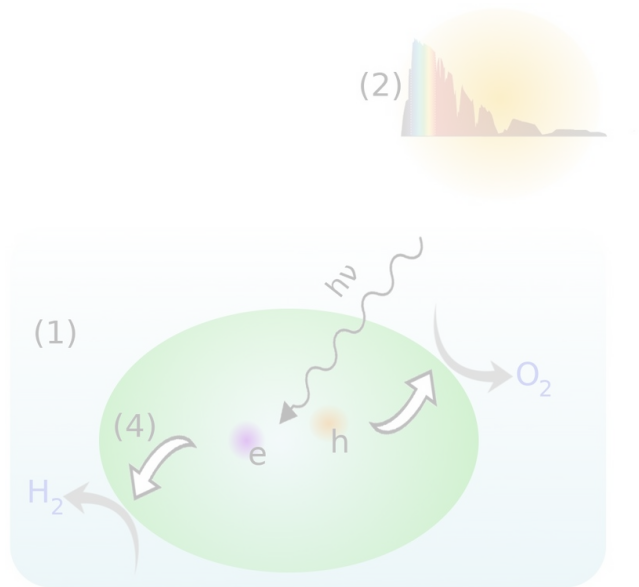
For each slide: what is the main point of the slide

what is the main point of the figure

# Water Splitting for Clean Fuel (with oxides)

Materials for photoelectrodes in **water splitting** offer a sustainable way of producing **clean fuels**

An ideal material:



(Minimum) Materials Criteria:

- (1) **Stability** in aqueous environment
- (2) **Band gap** in visible
- (3) **Band edges** near reaction potentials
- (4) Sufficient hole and electron **mobilities** \*

Our materials system of choice is bismuth vanadate ( $BiVO_4$ )

\*W. Wang, et al. "The role of surface oxygen vacancies in  $BiVO_4$ ." Chemistry of Materials. 32, 2899-2909 (2020).

Keep it simple/Less is more

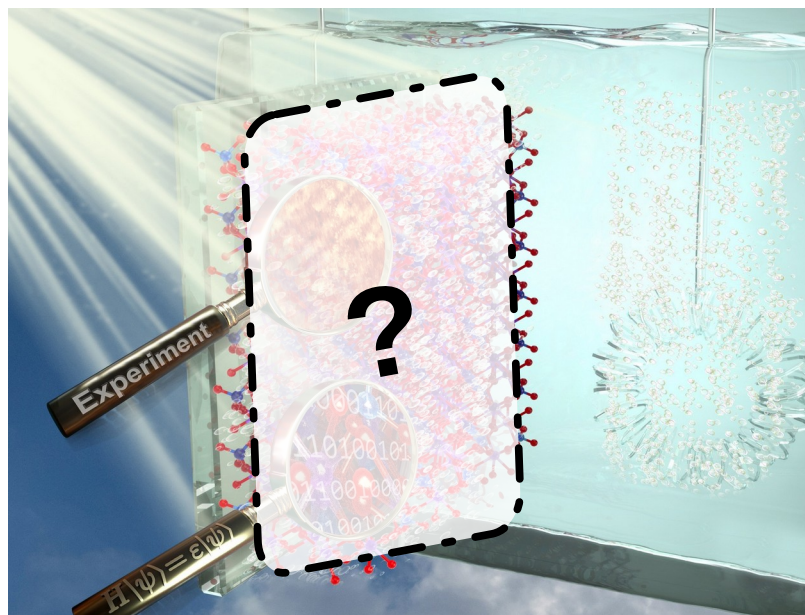
# Motivations: Interface- & Surface-driven phenomena

What is the structure of the surface?

How does surface/interface influence photoelectrochemical activity?

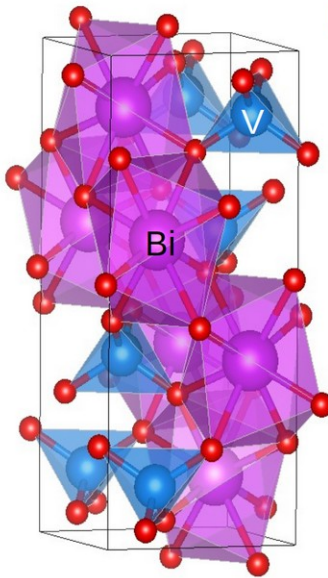
What are the ways and signatures of water interacting with the surface?

Reinforce  
main question  
with text and  
image (and  
speech)



# Use color to your advantage

## Why BiVO<sub>4</sub>?



BiVO<sub>4</sub> is an attractive photoanode for oxygen evolution

Stable

Band gap

Band alignment

Synthesis

e<sup>-</sup>-h<sup>+</sup> yields

OER kinetics

Recombination

against corrosion<sup>1,2</sup>

2.4 – 2.6 eV<sup>3,4,5,6</sup>

Favorable w/ H<sub>2</sub><sup>3,7</sup>

Many and varied; not \$\$<sup>1</sup>

High, >70%<sup>4</sup>

Slow (requires co-catalyst)

In bulk & surface (?)

Good things in green

Bad things in red

Other things color coded

Interfacial  
phenomena

1) Y. Park, ... K.S. Choi. *Chem. Soc. Rev.* **42**, 2321 (2013).

2) T.W. Kim and K.S. Choi. *Science*, **343**, 990 (2014).

3) M. Favaro, ... R. van de Krol, D. Starr. *J. Phys. Chem. C*, **123**, 8347 (2019).

4) T.W. Kim, ... G. Galli, K.S. Choi. *Nat. Comm.*, **6**, 8769 (2015).

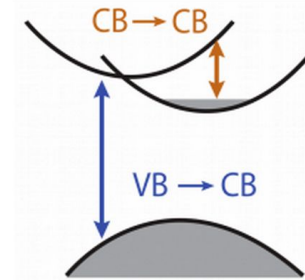
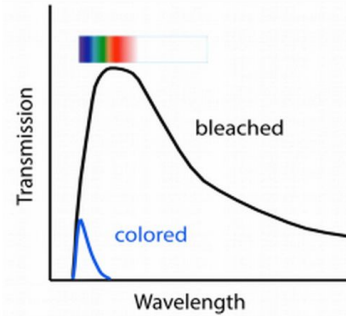
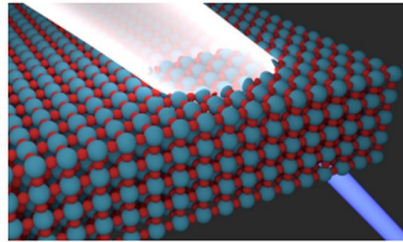
5) D.J. Payne, ... L.E.J. Piper. *App. Phys. Lett.*, **98**, 212110 (2011)

6) M.V. Malashchonak, ... A.V. Mazanik. *Mat. Chem & Phys.*, **201**, 183 (2017)

7) J.K. Cooper, ... I.D. Sharp. *Chem. Mater.* **26**, 5365 (2014).

# Use color to your advantage

## Optical Absorption: Why & What



$$\varepsilon_2(\omega) \sim \frac{1}{\omega^2} \sum_{v,c} \int_{BZ} \frac{2d\mathbf{k}}{(2\pi)^3} |\mathbf{e} \cdot \mathbf{M}_{cv}(\mathbf{k})|^2 \delta(E_c(\mathbf{k}) - E_v(\mathbf{k}) - \hbar\omega)$$

Large meshes needed

Transition exists




$$\mathbf{e} \cdot \mathbf{M}_{cv}(\mathbf{k}) = \langle \psi_{c,\mathbf{k}} | \mathbf{e} \cdot \mathbf{p} | \psi_{v,\mathbf{k}} \rangle$$

Transition strength

# Use color to your advantage

Using the school colors

<https://brand.utexas.edu/identity/color/>

| Color  | Pantone® | CMYK           | RGB/Hex                  |
|--|----------|----------------|--------------------------|
|   | PMS 159  | 0, 65, 100, 9  | 191, 87, 0<br>#bf5700    |
|   | PMS 432  | 65, 43, 26, 78 | 51, 63, 72<br>#333f48    |
|  | —        | 0, 0, 0, 0     | 255, 255, 255<br>#ffffff |

| Color  | Pantone®               | CMYK           | RGB/Hex       |         |
|--|------------------------|----------------|---------------|---------|
|   | PMS 2011               | 0, 48, 99, 0   | 248, 151, 31  | #f8971f |
|   | PMS 116 C<br>PMS 114 U | 0, 14, 100, 0  | 255, 214, 0   | #ffd600 |
|   | PMS 2300               | 40, 0, 89, 0   | 166, 205, 87  | #a6cd57 |
|   | PMS 2277               | 63, 0, 97, 20  | 87, 157, 66   | #579d42 |
|   | PMS 320                | 96, 0, 31, 2   | 0, 169, 183   | #00a9b7 |
|   | PMS 7469               | 100, 31, 8, 42 | 0, 95, 134    | #005f86 |
|   | PMS 7543               | 24, 9, 8, 22   | 156, 173, 183 | #9cadb7 |
|  | PMS 7527               | 3, 4, 14, 8    | 214, 210, 196 | #d6d2c4 |



# Make everything bigger

The quick brown fox jumps over the red dog.

The quick brown fox jumps over the red dog.

The quick brown fox jumps over the red dog.

The quick brown fox jumps over the red dog.

← Minimum font size: 18  
Max number of font sizes: 3

The quick brown fox jumps over the red dog.

The quick brown fox jumps over the red dog.

An 80-year old person with bifocals sitting in the back of the room  
should be able to read it

# Typeface

**Typeface**

**Roboto**

VS.

**Font**

Roboto Thin

Roboto Light

Roboto Regular

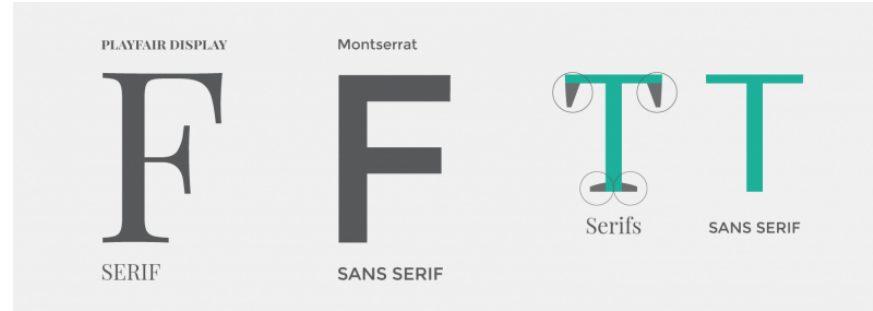
**Roboto Medium**

**Roboto Bold**

**Roboto Black**

# Typeface

Free from Google  
<https://fonts.google.com>  
“metrically compatible”



Short phrases  
(presentations, posters,  
Flyers)

WW uses  
Calibri/Carlito frequently

**Sans serif**

Tahoma

Arial

Verdana

Trebuchet

Gill Sans

**Serif**

Times

Georgia

Century

Garamond

Book Antiqua

Block text  
(papers, theses, proposals)

WW uses Cambria/Caladea  
frequently

<http://sixminutes.dlugan.com/slide-fonts>

# Typefaces

Meet the cast:

**A B C D**  
**E F G H I J K**  
**L M N O P**  
**Q R S T U V**  
**W X Y Z**

Now see the movie:

**Helvetica**

[https://watchdocumentaries.com/  
helvetica/](https://watchdocumentaries.com/helvetica/)

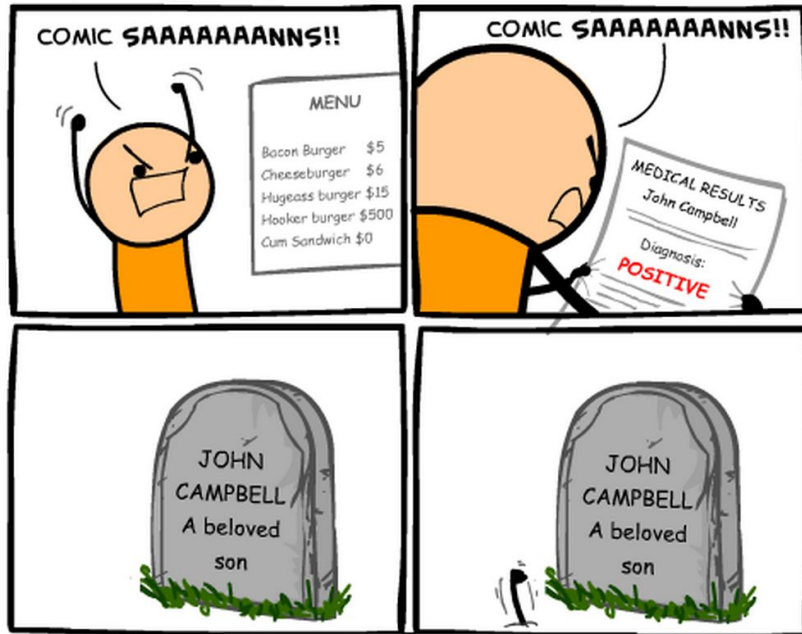
# Typefaces

## THE COMIC-SANS GAME! TRY IT!

Keep an eye out for everyone's favourite stylistically-awkward font in everyday life!

You'll notice it more often than you think!

If you see it, just raise your fist and shout "comic SAAAAAAAAAAAAANS!"



Cyanide and Happiness © Explosm.net

Comic Sans....please avoid



<https://www.lingoapp.com/blog/comic-sans-the-innocence-and-hijacking-of-a-much-hated-type>

# Practice, practice, practice

- Run through the presentation a few times until you are comfortable
- Get the timing down
  - Leave time for Q&A
  - Figure out how much time it takes for you to go through a slide
  - On average about 1.5–2min per slide, depending on density

## Learn to speak extemporaneously

- Prepare notes ahead of time
- Avoid speech fillers: “um”, “like”, “so”, etc.;
- Pauses are totally fine! They always feel longer as a speaker
- Don't get caught on speech flubs- they happen a lot, but they will stick out to you much more than anyone in the audience; no one will remember
- Practice in front of a mirror or record yourself

# Eye contact and gestures

Make eye contact in different places in the audience  
(or with the camera on video conferencing)

Gestures for emphasis

Hands and arms at rest at the side by default (feels weird, looks natural)  
or...



“Merkel Raute”

# Compress images where needed

- Make sure your images are portable/editable
  - paper, presentations, curation
- 600 dpi (dots per square inch) → high-resolution
- 300 dpi → publication quality
- 96-150 dpi → projector quality
- Raster images (bitmap, pixels): distortion when enlarged
  - JPG (lossy compression, less memory)
  - PNG (lossless compression, more memory)
- Vector image (geometric forms): clear resolution at any size
- Files on the order of 10s MBs

Image compression in powerpoint

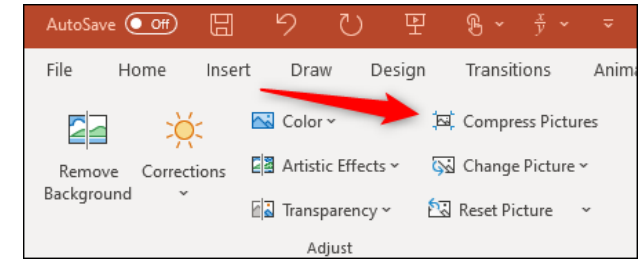
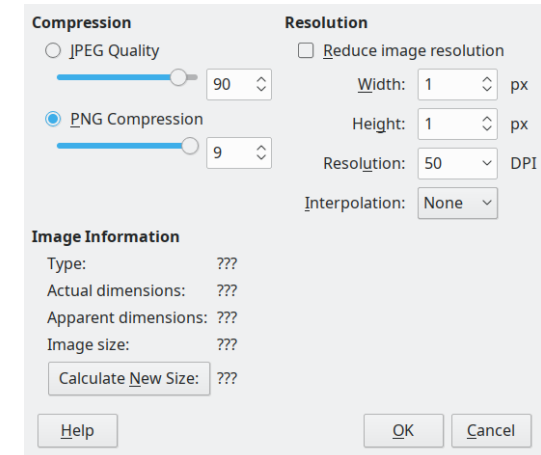


Image compression in LibreOffice





# Have backup slides ready

All the things you could not fit in the talk time-

- You'll discover what you actually present  
is a fraction of the actual work involved

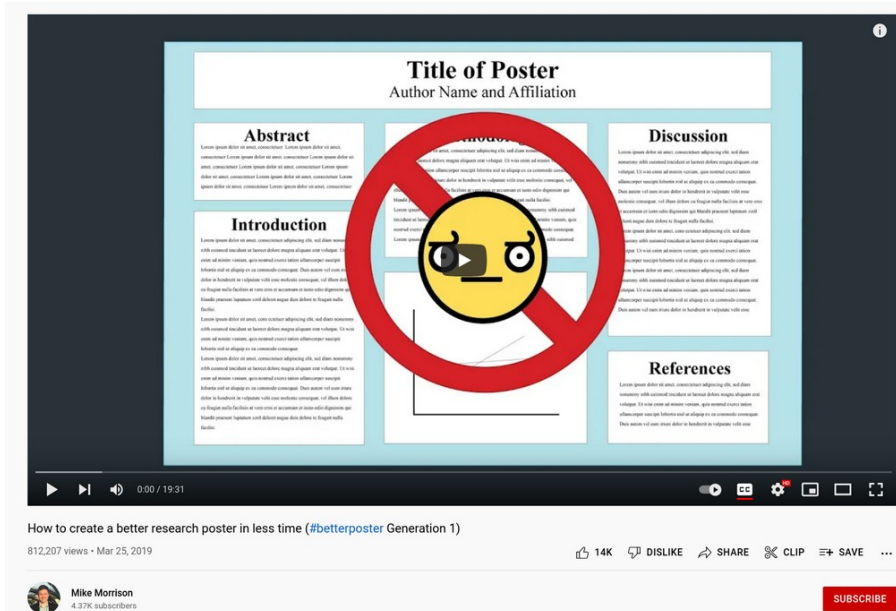
- You will pick and choose what is relevant to present based on
  - the anticipated audience
  - the type of conference
  - the overall message you want to communicate

e.g., dissertation: ~35 slides, 20 backup

# Find your style

Experiment and try new things!

## Aside: Making posters



<https://www.youtube.com/watch?v=1RwJbhkCA58>



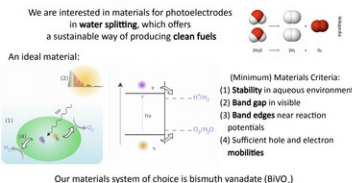
<https://www.youtube.com/watch?v=SYk29tnxASs>

Also great insights into how to work with natural human biases/psychology

# An example of the #betterposter format

## Tuning the surface composition of complex oxides for water-splitting technologies: A joint computational and experimental study

### Background & Motivations



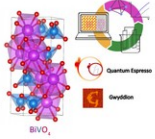
$\text{BiVO}_4$  is attractive as a photoanode material for oxygen evolution.

However,  $\text{BiVO}_4$  suffers from slow reaction kinetics and charge recombination, which are both **surface/interface driven phenomena**

The study of photoelectrode surfaces is challenging.

Our strategy is a **tightly-coupled collaboration** between experiment and theory in a self-consistent **feedback loop**, which achieves:

- Well-defined surfaces that only differ at the surface
- Photoelectrochemically active samples
- Established & benchmarked level of theory
- Matching structural models

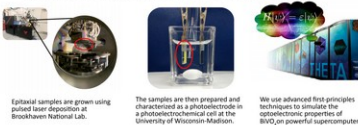


Our study is motivated by understanding:

What is the structure and composition of the surface?  
How does surface/interface influence photoelectrochemical activity?

### Methodology

We used a combination of experimental and computational techniques to prepare two different surface terminations: as-prepared and base-treated samples.

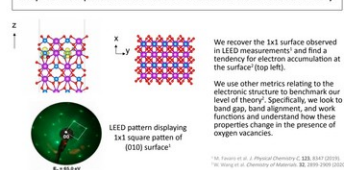


Epitaxial samples are grown using pulsed laser deposition at Brookhaven National Lab.

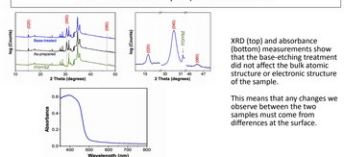
The samples are then prepared and characterized as a photoelectrode in a photoelectrochemical cell at the University of Wisconsin-Madison.

We use advanced first-principles techniques to simulate the photoelectrochemical properties of  $\text{BiVO}_4$  on powerful supercomputers.

### Step 1a: Computational validation of structure and level of theory



### Step 1b: Various metrics confirm that the base-etching surface treatment used only impacts the surface.



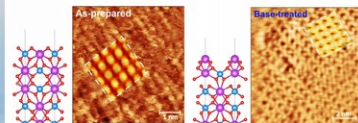
We show at the atomic level how changes in the surface composition of a photoelectrode critically impact the photoelectrochemical performance for water splitting.



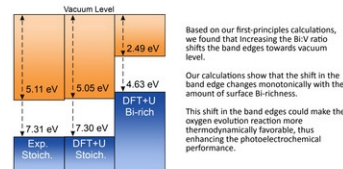
"The impact of surface composition on the interfacial energetics and photoelectrochemical properties of  $\text{BiVO}_4$ ." *Nature Energy*. (2021).

### Step 2: Matching structural models with simulated and measured STM

We constructed structural models that mimic the two experimental samples of  $\text{BiVO}_4$  with two different surfaces by comparing simulated and measured scanning tunneling microscopy (STM) images.

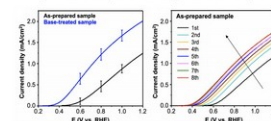


### Step 3: Predictions from calculated electronic properties of structural models



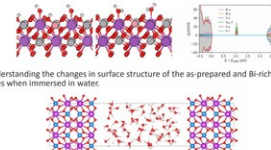
### Step 4: Comparing the current-bias curves for different surface compositions

- J-V measurements in conjunction with low-energy ion scattering measurements demonstrate that:
- 1) higher surface Bi-richness leads to higher current densities and lower current onset potentials.
  - 2) the surface composition can change with number of cycles.



### Next steps: understanding surface composition impacts at the interface with water

- 1) Understanding the enhancement in the electron polaron formation on the stoichiometric surface with adsorbed water based on ResPES measurements.
- 2) Understanding the changes in surface structure of the as-prepared and Bi-rich surfaces when immersed in water.



GALLI GROUP

Materials and Molecules from First Principles



This research exists in the Galli group ecosystem, which focuses on predicting and engineering materials properties from atomistic simulations on materials for quantum technologies and sustainable energy

Wenmiao Wang<sup>1</sup>, Dongho Lee<sup>2</sup>, Chenyu Zhou<sup>3</sup>, Xiao Tong<sup>4</sup>, Emily Chen<sup>4</sup>, Marco Favaro<sup>4</sup>, David Starr<sup>4</sup>, Kyung-Shin Choi<sup>4</sup>, Minghao Liu<sup>4</sup>, Giulia Galli<sup>1,4</sup>

# Guidelines for journal club

## Types of topics

- Tutorials on a specific technique
- Methodology developments
- New physics or chemistry
- Studies that revisit published results

## Identifying a topic

- Relevant (tangentially or directly) to participating members?
- 

## Where to start:

- Review or perspective or accounts
- High-impact/flagship journals

## What to include in a journal club presentation

- Sufficient background/context
- Motivations of the paper
- What did they find?
- How did they find it? (Use figures, tables; keep in mind methodology)
- 1-2 main points you want people to remember

## As an audience

- Think about connections to your own research
- Come prepared to ask questions