Scientific Communication (How to Give a Talk Talk)

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Everything!

Every step of your career will hinge on your ability to
communicate your research

Improving your ability to communicate science
requires work

Different Types of Scientific Communication

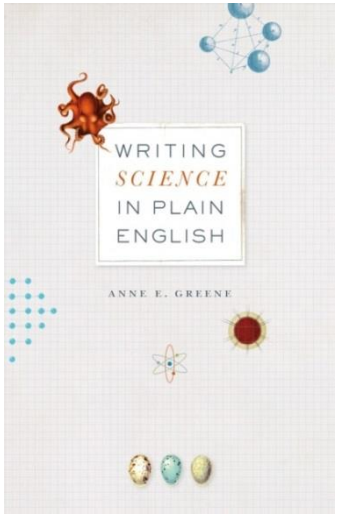
Written Communication

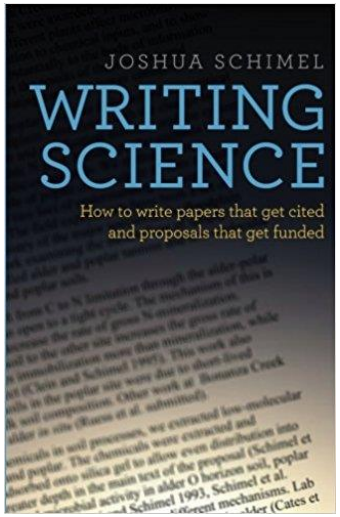
- Abstracts
- Grant proposals
- Scientific papers
  - Communications
  - Full Papers
  - Reviews

Oral Communication

- Elevator pitch
- Scientific talks
  - Research talks
  - Literature talks

Recommended Reading:





Learn to write well by **studying well-written papers**

The Elevator Pitch

Scenario:

- You run into one of your scientific heroes in an elevator/poster session

Goal:

- Introduce yourself and summarize your research in a coherent and memorable way in **30 seconds**

Pitfalls:

- Too vague
- Too specific/rambling
- Inability to answer follow-up questions

You need to practice this!

Try to seek out these opportunities

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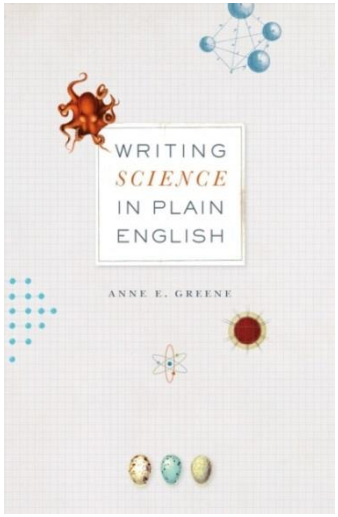

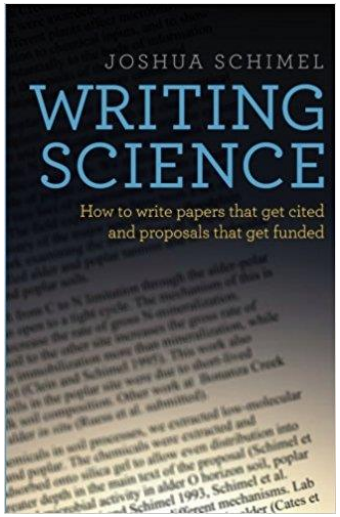

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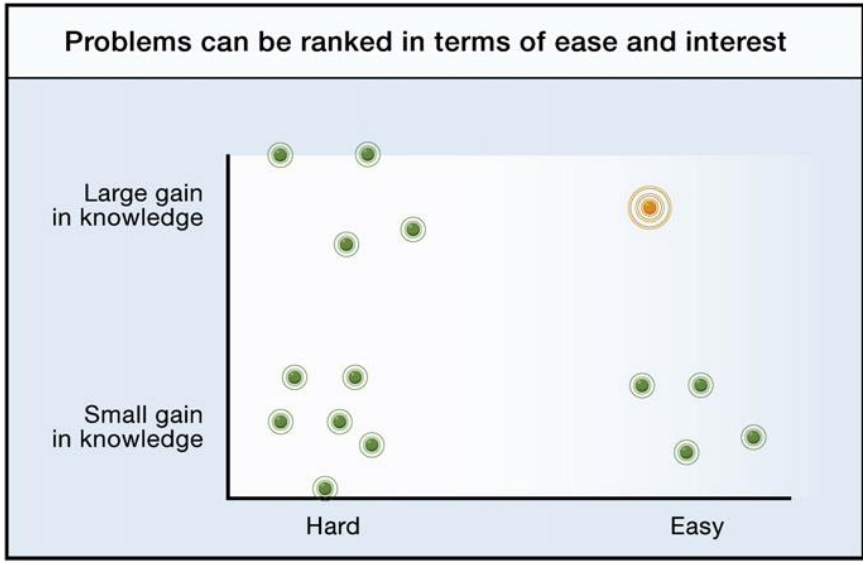
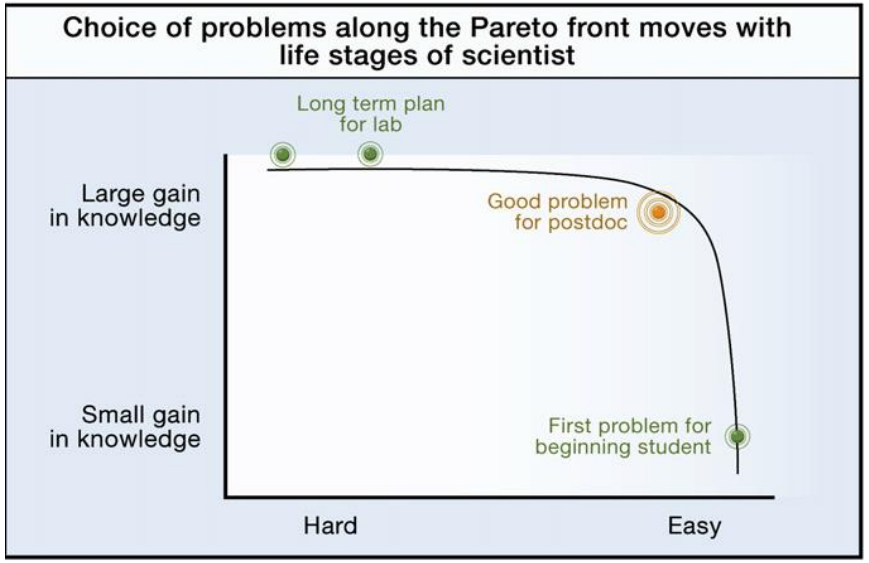
Choosing a Scientific Problem





Steps to take when starting a project:

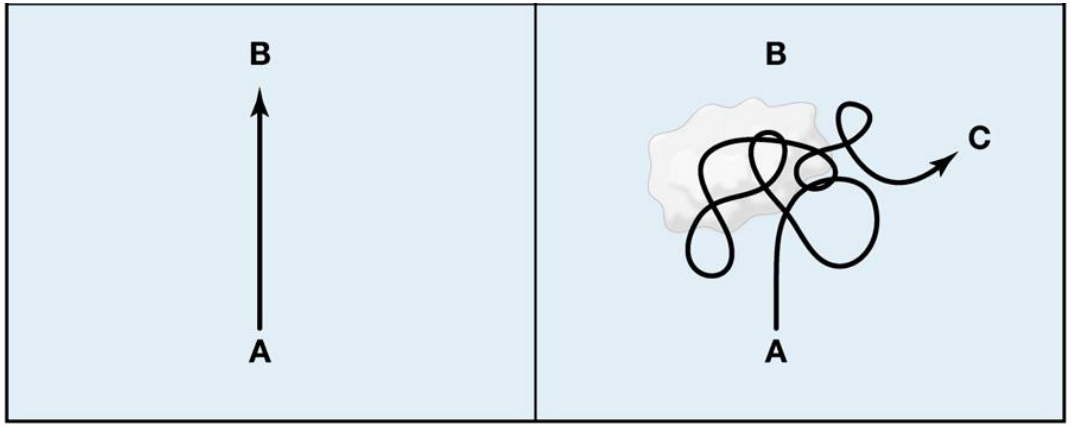
1. Determine the <u>context</u> of your project with regard to:
   - Your research and your career
   - Your group's research
   - The broader field
   - Society

2. Determine specific questions to be answered and <u>how</u> they can be answered

Make sure your project matches the stage of your career

U. Alon, *Mol. Cell*, **35**, 726 (2009).

- Explain how you have addressed an **interesting scientific question**
- Teach the audience things that are **relevant to their interests**
- **Sell** an idea or a tool
- The purpose of a talk should **never** be to show off how smart you are and how much work you have done



Even though research takes twists and turns, your presentation should probably follow a **straight path from start to finish**

U. Alon, *Mol. Cell*, **35**, 726 (2009).

- Forgetting that you know more about your project than your audience
  - Introduce your work in a **gentle, methodical** manner

Rule 1: Know your audience!

- Getting bogged down in **unimportant details**
  - Don’t include details unless they are vital to the **main point of your talk**

- Running over time
  - **Practice!**

Make your slides **clean, simple, and attractive**

If your slides are sloppy, your science is probably sloppy!

Rule 2: Slides are **cheap**, but space on a slide is **valuable**

(this **does not** mean to fill your slides with details!)

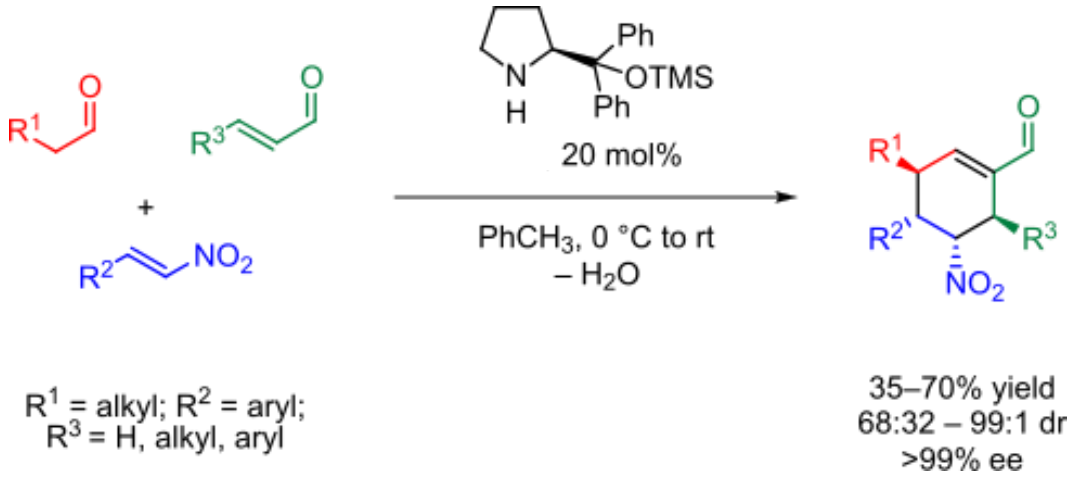
Use a simple, clutter-free template

Use slide titles to convey information about each slide

Slides should be mostly figures/pictures with **very few words**
(this is not a typical talk)

Use colors and animations with a **purpose**

When Drawing Structures, Use Colors with a Purpose



R^1 = alkyl; R^2 = aryl;
R^3 = H, alkyl, aryl

35–70% yield
68:32 – 99:1 dr
>99% ee

Don’t make your audience work harder than they must

Rule 3: A Scientific Talk is a Story

(Research talk)

Beginning

- Set the stage
- **Goal:** Convince the audience that there is an **important gap** in our knowledge/abilities
- For a 40 minute talk, have **one overarching question** comprising 2-3 smaller questions

Middle

- Present your results
- **Goal**: Clearly and methodically show what you have done to **address the gap** in our knowledge/abilities

End

- Summarize key results
- **Goal**: Connect what you have done to the **questions raised** in the Beginning

Please **do not** include an ‘Outline’ slide

Rule 3: A Scientific Talk is a Story

(Literature talk)

Beginning

- Set the stage
- **Goal:** Convince the audience that there is an **important controversy** in the literature
- For a 40 minute talk, have **one main controversy** and present 2-3 different sides/perspectives

Middle

- Present your results
- **Goal**: Clearly and methodically show what has been done to **shed light on the controversy**

End

- Summarize key points of both sides or perspectives
- **Goal**: Provide you own critique/commentary and make suggestions regarding work that can be done to settle the controversy once and for all

Please **do not** include an ‘Outline’ slide

Statement of controversy

Side A	Side B
• Main results supporting Side A • Main results supporting Side A • Main results supporting Side A	• Main results supporting Side B • Main results supporting Side B • Main results supporting Side B

(use a slide like this to introduce both sides of controversy and to transition between talking about the different sides)

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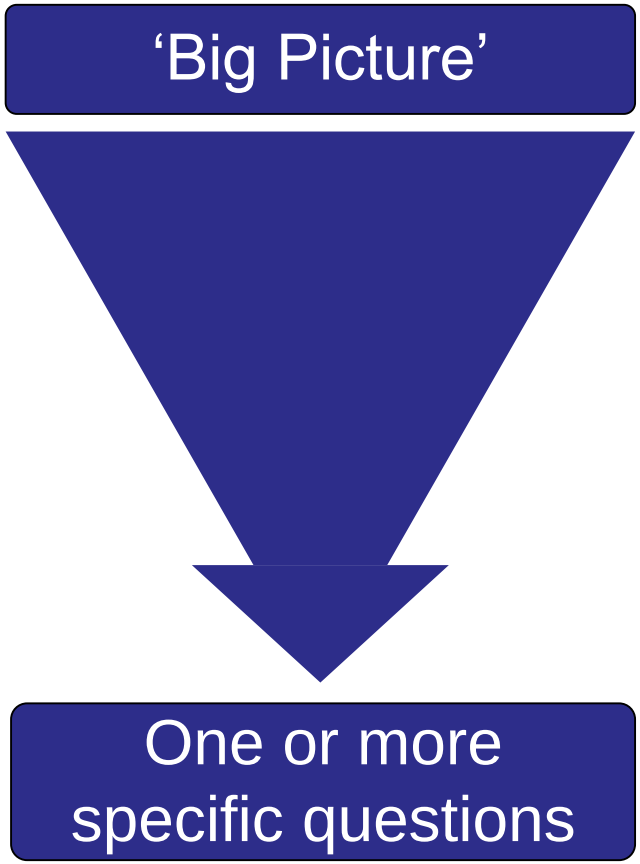
- A bad Introduction can ruin an otherwise good talk
- **Goal:** Convince each member of the audience to listen to the rest of your talk
- **Approach:** Convince the audience that you are going to address a question that is **important to them**

Rule 1: Know your audience!

Common Pitfalls

- Failure to **clearly** raise an important scientific question
  - At the end of your Introduction, state the problem/question you wish to solve/answer
- The bait and switch
  - By the end of your talk, you must have **addressed** each of the questions raised in the Introduction

- Start out broad
- Narrow your focus to the questions you plan to answer
- You want to **lead the audience** to the main questions you plan to answer



- At the end of your Introduction, the audience should have a clear idea of:
  - The questions you plan to answer
  - The broader significance of those questions

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One slide, one point

If you can't summarize a slide in a simple sentence then that slide is **too complicated**

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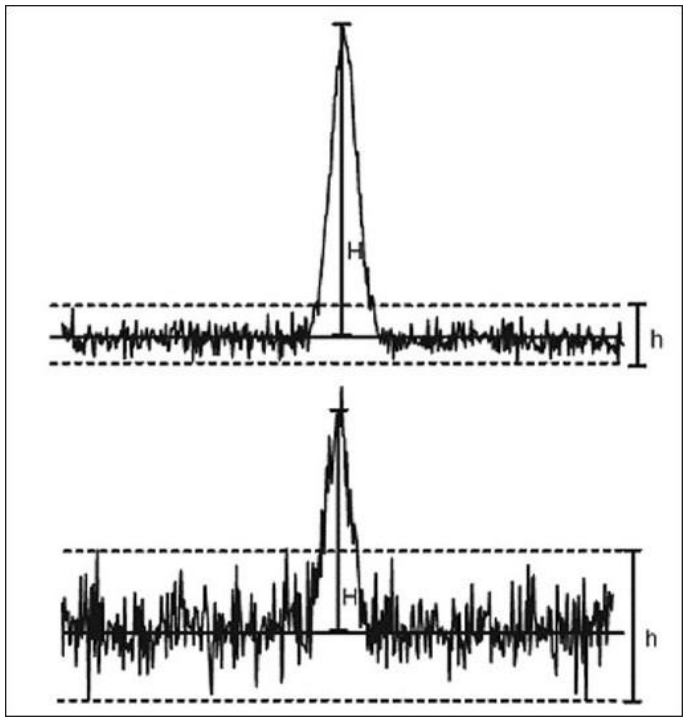


Your goal is to **maximize** signal to noise

Every word, every image, and every table must **earn its place** on your slide

If you have trouble sticking to the main point, include it on your slide

Do not cut and paste tables from a paper

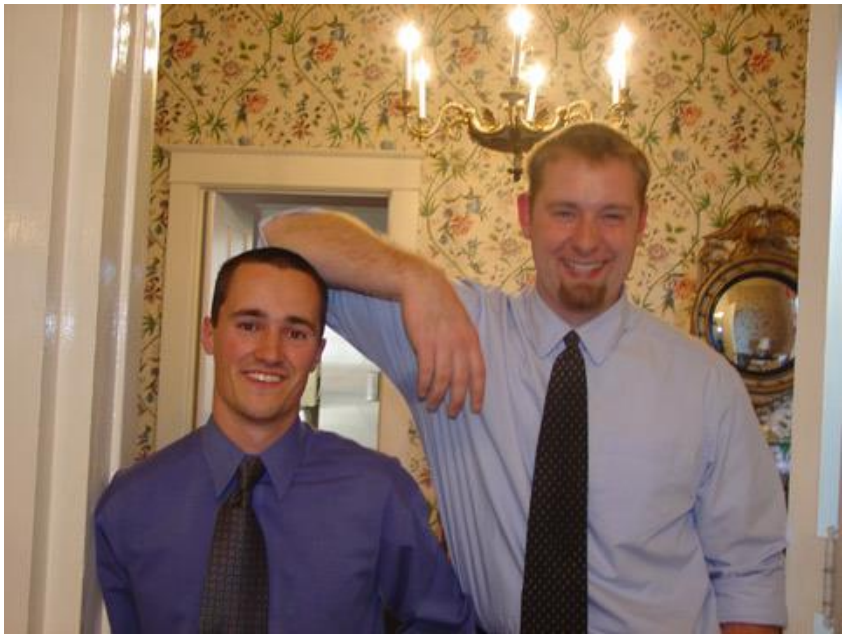
Rule 2: Slides are **cheap**, but space on a slide is **valuable**

Only include data that will be discussed!

Goal: Show how well DFT can predict electron affinities

TABLE I. DZP++ and CCSD(T)/aug-cc-pCVQZ adiabatic electron affinities (AEA) in eV.

	BH&HLYP	BLYP	B3LYP	CCSD(T)/aug-cc-pCVQZ	Expt.
SiH_2	1.02	1.07	1.19	1.05	1.124 ± 0.02 (Ref. 3)
$Si(CH_3)_2$	0.38	0.46	0.55		
$Si(SiH_3)_2$	1.98	1.95	2.11		
SiF_2	0.41	0.46	0.57		0.1 ± 0.1 (Ref. 34)
$SiCl_2$	1.50	1.38	1.57		
$SiBr_2$	1.72	1.56	1.76		
$HSiSiH_3$	1.55	1.56	1.70		
CH_3SiSiH_3	1.23	1.24	1.38		
$HSiCH_3$	0.65	0.71	0.82		
SiHF	0.76	0.79	0.91		
SiHCl	1.29	1.24	1.40		
SiHBr	1.41	1.33	1.51		
$SiFCH_3$	0.40	0.46	0.56		
$SiClCH_3$	1.03	0.93	1.07		
$SiBrCH_3$	1.09	1.04	1.19		
SiFCl	0.99	0.95	1.10		
SiFBr	1.14	1.08	1.23		
SiClBr	1.61	1.47	1.67		
$FSiSiH_3$	1.31	1.31	1.45		
$ClSiSiH_3$	1.77	1.69	1.87		
$BrSiSiH_3$	1.86	1.75	1.94		



Larkin and Schaefer *J. Chem. Phys.* **121**, 9361 (2004).

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Problems:

- Low resolution
- Much of the data is **not discussed**
- References to **unknown experimental papers**

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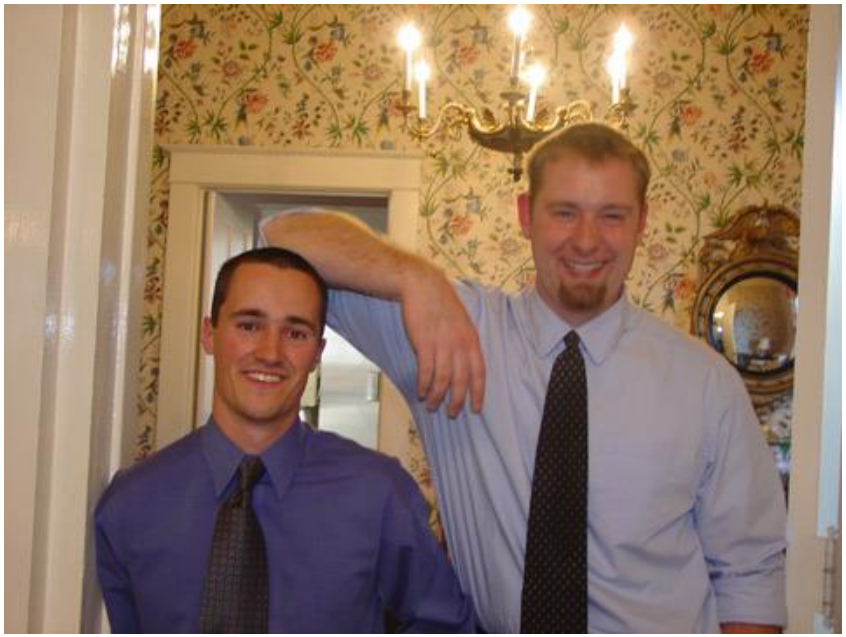

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Adiabatic Electron Affinities (eV)

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SiH_2	1.02	1.07	1.19	1.05	1.124 ± 0.02 (Damrauer)
SiF_2	0.41	0.46	0.57	-	0.1 ± 0.1 (Kawamata)

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Usually, a plot is better than a table

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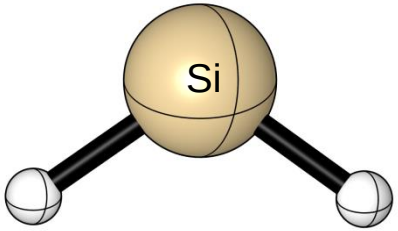

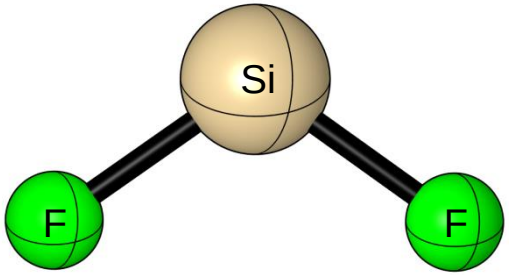

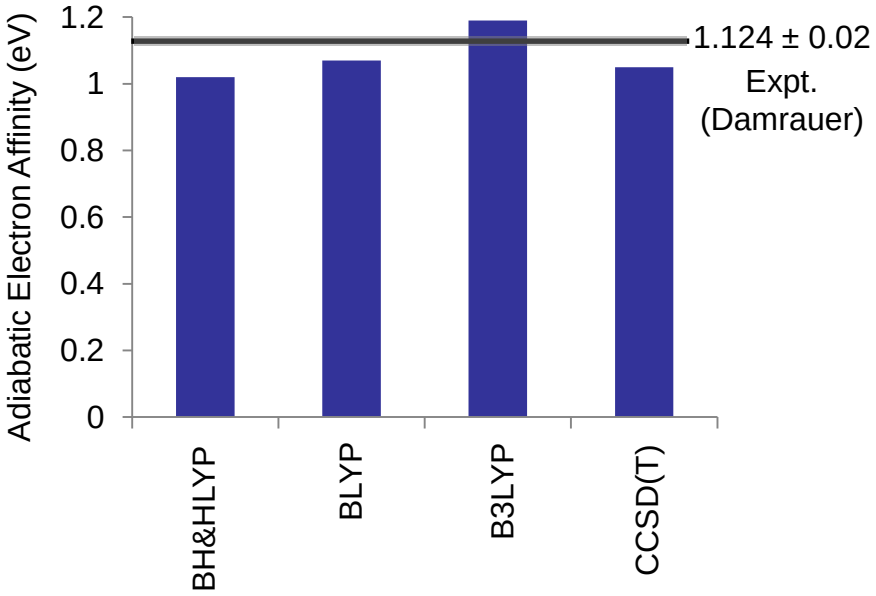

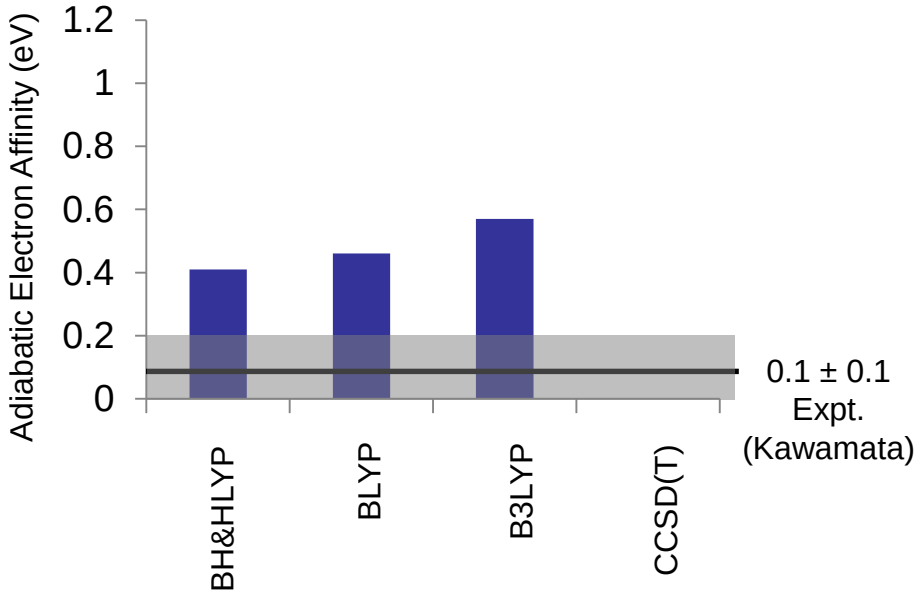

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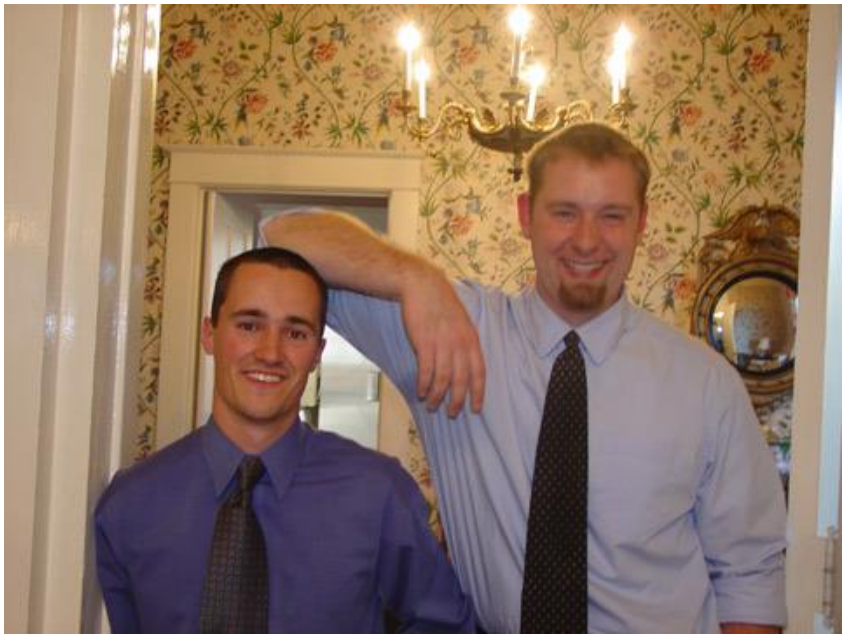

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Figures for talks are **different** from figures for papers

- Labels
- Shape
- Density of information

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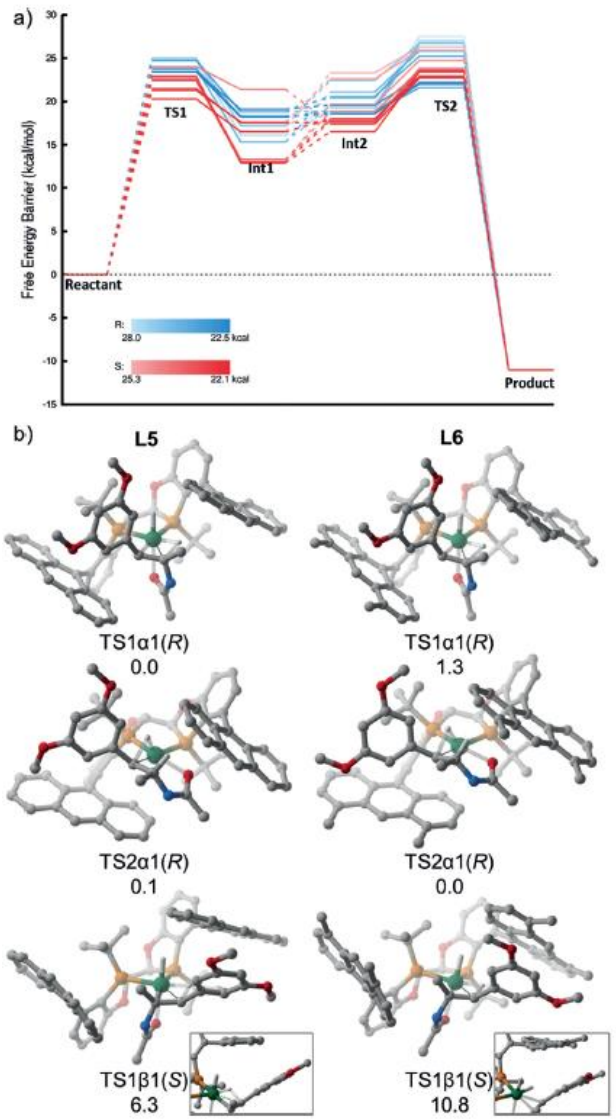
Figures should be clean, crisp, and **self-contained**

If you want your audience to compare
two structures or plots, **show both** on the slide!



Problems:

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- Wrong shape
- Unnecessary labels

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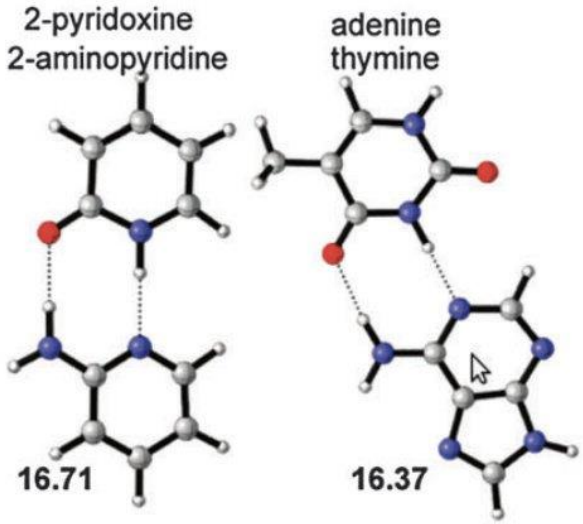

Be careful taking screen shots!

Guan and Wheeler, *Angew. Chem. Int. Ed.* **56**, 9101 (2017)

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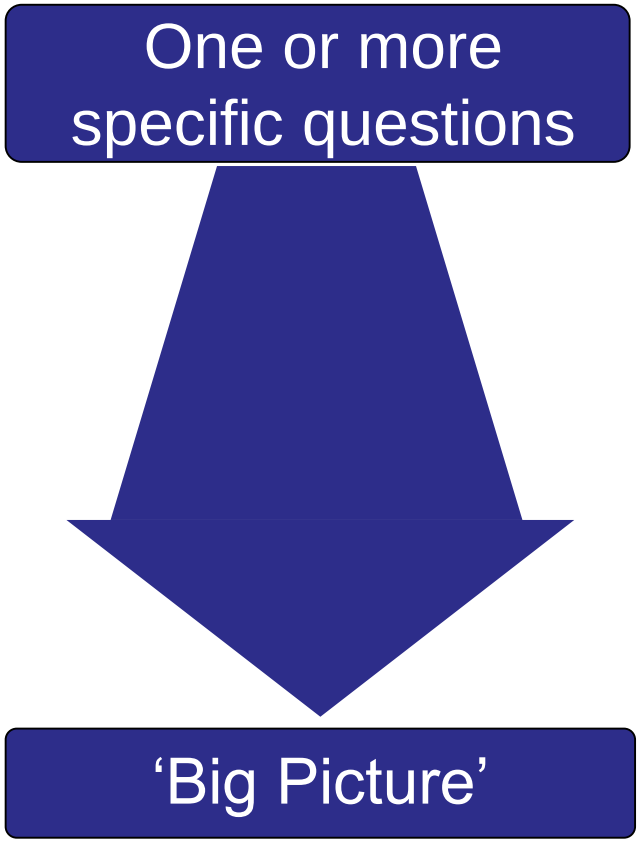
Your Conclusions/Summary section is your opportunity to:

- Highlight key results
- Revisit the questions raised in the Introduction
- Suggest broader impacts, future work, etc.



The Summary should be **brief** and **include images**

Summary: Communicating Science is a Vital Skill to be **Developed**

- Develop and practice your ‘Elevator pitch’
- When building a talk, remember:

Rule 1: Know your audience!

Rule 2: Slides are **cheap**, but space on a slide is **valuable**

Rule 3: A Scientific Talk is a Story

- Building a good talk takes **time, effort, and planning**
- Devote time to **making good figures**
- Practice. You get better at giving talks by giving talks