You need a job (and maybe tenure)

- Academic hiring (and postdoctoral, national labs, ...)
- The tenure tour

Most science is transmitted orally

- 55% of scientific papers receive no citations within 5 years of publication

Why is Public Speaking Important?
Planning a Scientific Presentation

Know your audience

• Why should they care about your work?
• Never overestimate your audience (or their attention span)
• Aim your presentation at the median person, not the expert

Tell a story, don’t present a report

• Plan your take-home message first
The Structure of the Talk

• Introduction (and title)
  Most important slide (everyone is paying attention)
  Give “the big picture”
  Should introduce the take-home message
  Must pass the “parent test”

Memorize the first 3 sentences of your talk!
Silicon Etching: Atomic-scale Nanofabrication
Melissa A. Hines, Dept. of Chemistry, Cornell University

Can we use chemistry to control surface morphology?

Today’s Devices
Increasing roughness from 2 → 10 Å rms decreases channel mobility by a factor of 2!

Electron scattering at Si/SiO₂ interface
Potential application: Integrated frequency standards & filters (e.g., cell phones)

Requirement: \( f \approx \text{few GHz} \) & \( Q \approx 10^5 \)

Problem: Quality \((Q)\) plummets with increasing \( f \)
The Structure of the Talk

• Introduction (and title)
• Outline of talk
The Odyssey (starring Odysseus)
Homer, Poet in Transit

- Finish Trojan war
- Travel for 10 years
  - Visit Lotus Eaters
  - Blind the Cyclops
  - Shack up with Circe
  - Pass between Scylla and Charibdis
  - Listen to Sirens
- Return to Ithaca
  - Kill wife’s suitors
  - Live happily ever after
The Structure of the Talk

- Introduction (and title)
- Outline of talk
- Experimental/Computational

Keep it simple!

No gratuitous photos
The Chemistry of Etching: An Atomic Scale View

Experimental:
- Etching in aqueous NH₄F
- Unreconstructed, H-terminated Si(111)

Computational:

Atomistic Model of Etching
J. Flidr, Y.-C. Huang, T. A. Newton and M. A. Hines,

- Kinetic Monte Carlo simulations
- Full atomic structure incorporated
  (known from FTIR studies)

- Parameters:
  Site-specific etch rates
The Structure of the Talk

- Introduction (and title)
- Experimental/Computational
- Body
  
  Tell a story, don’t give a report
  Logical, not chronological, order
  A series of questions and answers is effective
The Structure of the Talk

- Introduction (and title)
- Experimental/Computational
- Body
- Conclusions & Acknowledgments

Keep it simple! Reiterate take-home message

Out of time: Let the audience read
Conclusions

- STM and simulations yield quantitative information on defect site reactivity
  - NH$_4$F etching consistent with pentavalent transition state
  - O$_2$ preferentially inserts into steps. No evidence of radical anion mechanism.

- Orientation-resolved kinetic studies offer new insights into etching

Acknowledgments

Yi-Chiau Huang  Rikard A. Wind
Jaroslav Flidr  Simon P. Garcia
Theresa A. Newton  Hailing Bao

National Science Foundation
Cornell Center for Materials Research
Cornell Nanofabrication Facility
Petroleum Research Fund
Handling Questions

• Make sure you understand the question
  If necessary, repeat or rephrase the question

• Keep your answer short and to the point
  Don’t be arrogant or hostile

• Useful answers for awkward situations
  “That’s an interesting point. I’ll have to think about it.”
  “Maybe we should discuss this off-line.”

• Watch out for ringers
The Intangibles

Presentation style is important
• Speak firmly, slowly and confidently
• Look at the audience
• Learn to use pointer & microphone

Expect the unexpected
• Use your own laptop if possible
• Check equipment right before the talk
• Bring back-up media and pointer

Practice! Practice! Practice! Practice!
Planning your slides

Timing is critical!
- Going overtime is rude
- A seriously undertime talk is embarrassing

Rule of Thumb: 2 minutes per slide
- Conclusions & acknowledgments somewhat less
- Going faster will annoy the audience

Only one concept (or experiment) per slide
The Nuts and Bolts

A good slide speaks for itself

Structure of a slide

- Remember the lost and confused!
- Informative title and self-contained content
- Use short phrases, not complete sentences
- Do not use garish or gratuitous colors
- Conclusion and/or segue at bottom
The images show that the dislocation spacing depends sensitively on the angle. Note that the 0.4° sample is not as periodic as the 0.9° sample.
Small Angle Buried Dislocations imaged by TEM

Increasing twist angle leads to decreasing spacing

Too busy! Improve with animation.
Small Angle Buried Dislocations imaged by TEM

Animation Steps:
1st

Increasing Twist Angle

0.4°  0.6°  0.9°  2°

50 nm  38 nm  25 nm  10 nm

2nd

Increasing Dislocation Spacing

3rd

4th

Increasing twist angle leads to decreasing spacing
• **Size matters!**
  • Big type is important (This is Helvetica 24)
  • Everything on slide must be legible
  • Use the 8' test

Legible at 8 feet?
The Nuts and Bolts

- Size is important
- Font is important

*Use a font designed for headlines/labels*
Fonts are Serious Business

There are two general classes of fonts

Legible Fonts

Legibility: Ease of character recognition

Readable Fonts

Readability: Ease of reading large blocks of text (i.e. paragraphs)

Use a sans serif font!
Font Color is also Important
The Nuts and Bolts

• Large, bold san serif font

• Choose colors to maximize contrast
  
  Best: Black text on white  
  Dark color on white OK  
  White text on black OK  
  Avoid colored text on colored background

• Use contrast and size to prioritize information
What is wrong with this graph?
What is wrong with this graph?
Improved Presentation of Data

![Graph showing the relationship between frequency (MHz) and etch time (min) for different paddle widths. The graph includes lines for different widths: 2.5 μm (green), 4.0 μm (red), 5.5 μm (purple), and 7.0 μm (blue). The y-axis represents frequency in MHz, and the x-axis represents etch time in minutes.]
Presenting Equations

Rule #1: Don’t do it!

Rule #2: There is no rule #2.

Alternatives: Show a graph of the equation

Sketch the physical concept
Some Closing Thoughts

- Practice your talk out loud
- Practice your talk on friends
  - Catch typos, missing labels, & inconsistencies
  - Recruit outside your group
  - Ask to speak at an outside group meeting

Solicit (and give!) honest, constructive criticism

  Tough criticism from a friend is better than not getting the job