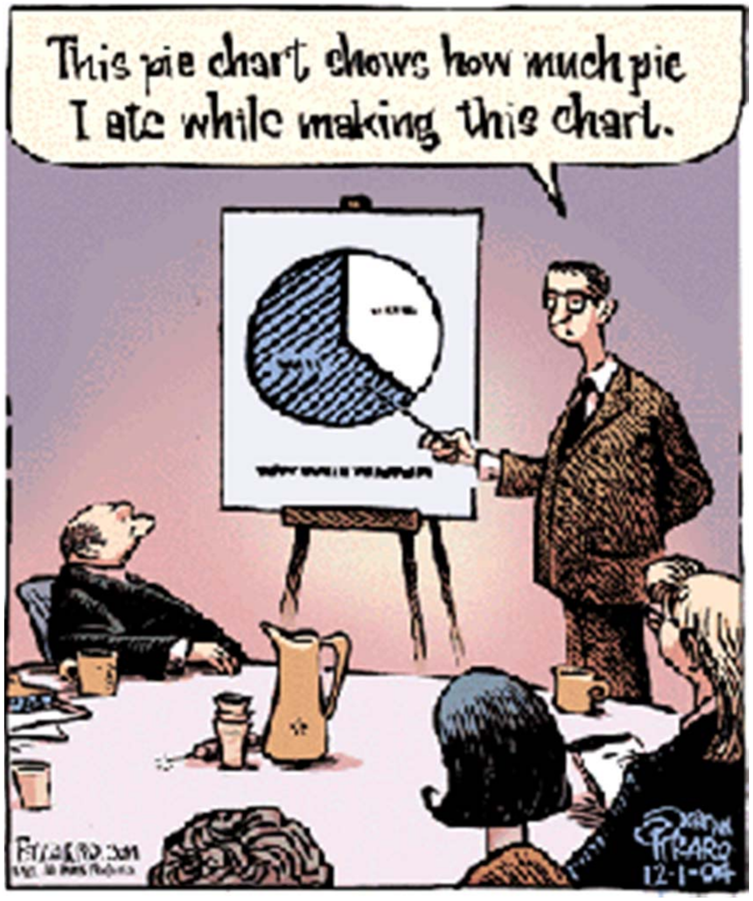
Tips for creating and giving scientific presentations



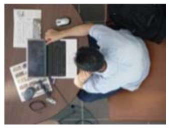
How to get started?

Step 1: Identify your audience: this will control the level of your presentation and the amount of background material you need to orient everyone in the audience

Step 2: Determine how much time you have for your presentation: this will control how much time you have to talk about each part of your outline (see below)

Step 3: Identify the main points you want to convey: you can reasonably convey only 2-3 main points in a 20- or 30-minute talk

Step 4: Create an outline of your talk: this will build in the logical organization of your presentation and help you decide what figures and other supporting evidence you need to make your points



Organizing a 20-minute scientific talk

Background and Introduction (~5 minutes)

⇒ 4–5 slides

~1 Title slide - Your names, date, citation to paper

~1 Outline slide – Organization of talk

~1 Overview slide – Why is this research important?

~1-2 Background slides – Provides essential background for non-experts

Methods (~5 minutes)

⇒ 2–3 slides

Theoretical/experimental methods used in paper

Organizing a 20-minute scientific talk

Results (~7 minutes)

⇒ 4–5 slides

~ What did you (or the authors) find?

Only develop 1-2 key results

***Critique and Citation Summary** (~2 minutes)

⇒ 2 slides

1 critique slide – What was wrong with/good about the paper?

1 citation slide – What happened with the result/field after the paper?

Summary (~1 minute)

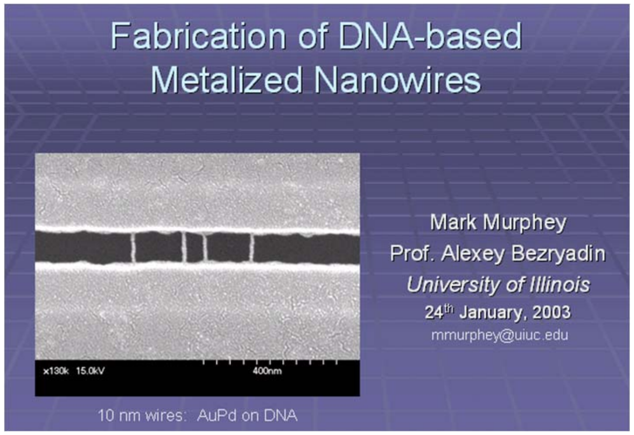
⇒ 2 slides

1 Summary slide - Review the main points/ criticisms

1 Acknowledgment slide – Acknowledge sources of material, help received, etc.

*Journal club only

The title slide and outline prepares the audience to listen and shows organization of talk

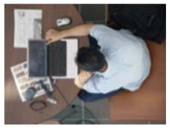


Title slide

- Your names and affiliations
- Paper citation (for JC)
- Venue and date
- Attention-getting graphic

Outline or overview of presentation

- Prepares the audience to listen
- Provides a logical structure for your talk
- Provides motivation and context
- Summarizes key points (limit to two or three for a 20- to 30-minute talk)



Particle Physicists Ask …

1. **Why matter?**
   - CP Violation

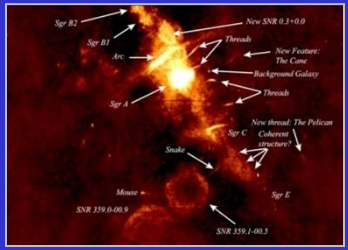
2. **Why mass?**
   - Higgs field

3. **Why this standard model?**
   - SUSY or other extensions

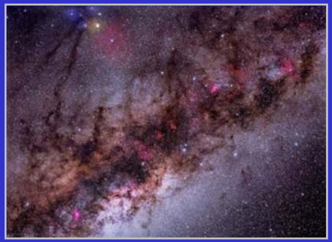
Great outline slide, especially for a general audience

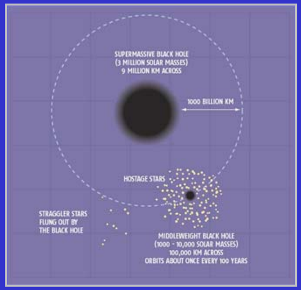
Overview

Black holes and star clusters

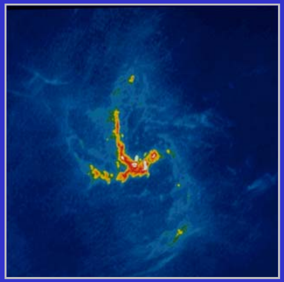


The galactic center





Intermediate-mass black hole kinematics



Here, we have a VISUAL and WRITTEN outline and it's not too long !

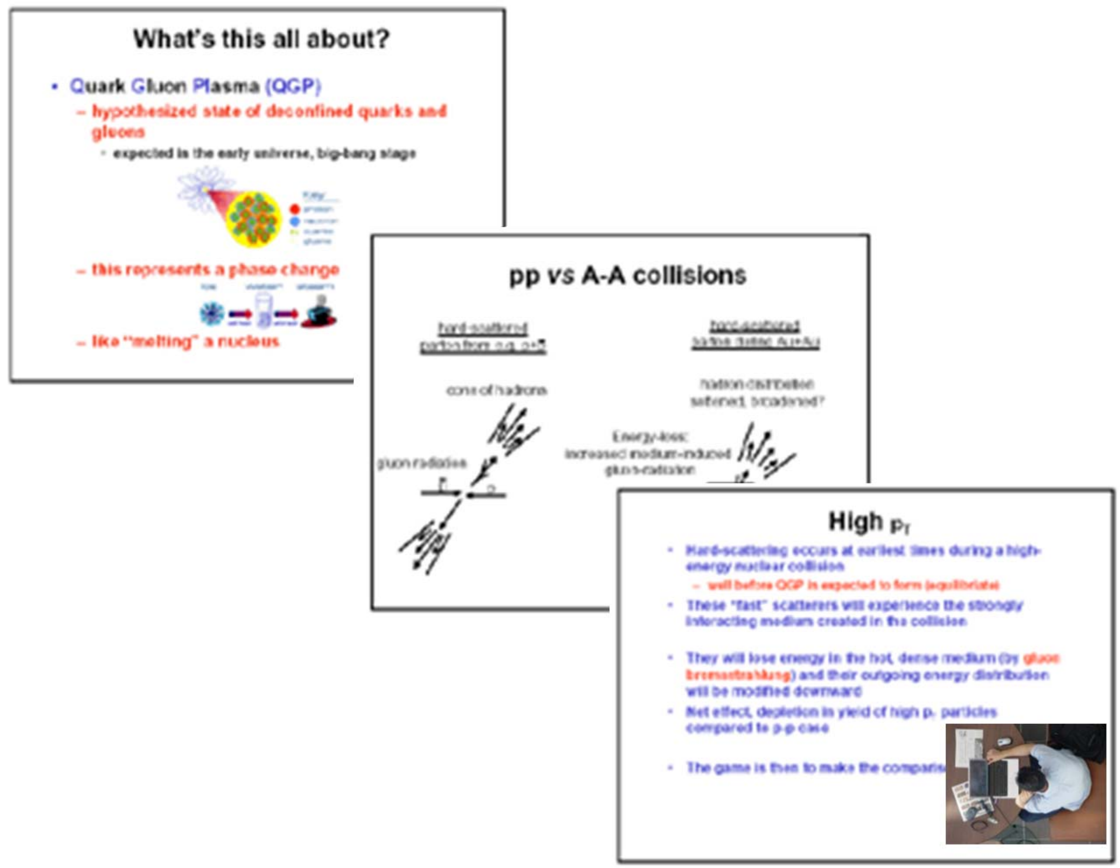
The “body” of your presentation is the intellectual content of your talk

Problem statement, motivation
~1–2 slides

Previous work
~1-2 slides

Methods
~1–3 slides

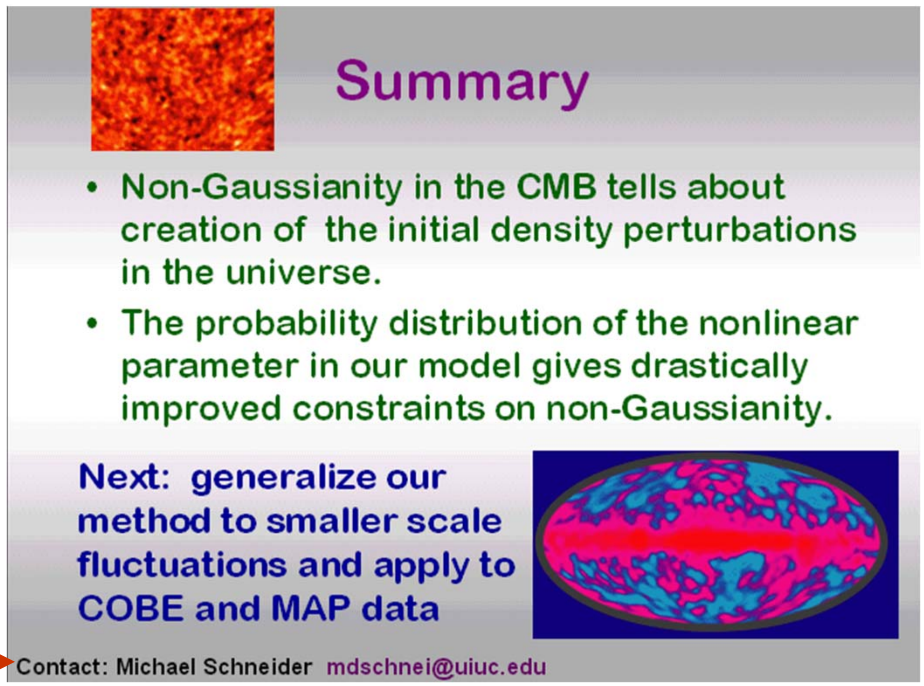
Key Results
~5–6 slides



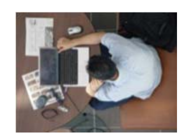
Provide a "summary" slide

Recap key results and conclusions

Reiterate main critiques (for JC)



This slide will probably stay on the screen during the question period and will thus get the longest audience exposure—make it count!



Summary & Conclusions

Not "exciting" but it has the pieces

- All g-2 data published
  - Systematics lowered again

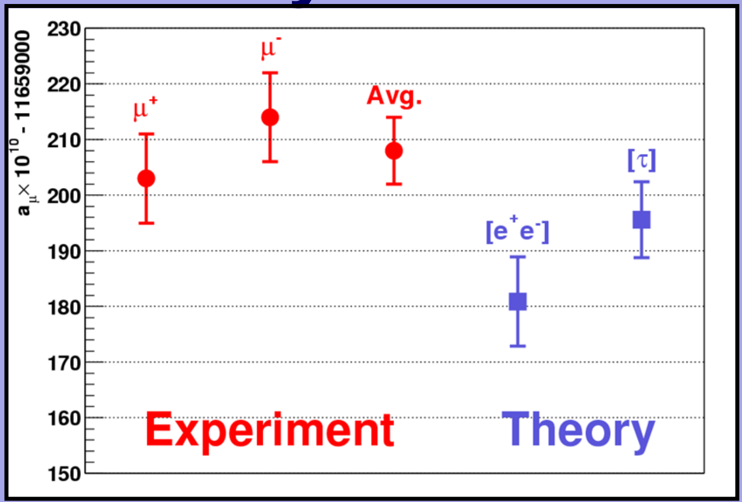
What was shown

- Consistent results, consistently above theory
  - ee – tau controversy sill quite active
  - considerably more "ee" type data on the way

Where things stand: summarized nicely on the plot

- The systematic limit is "far" away …we should go there

What to do next



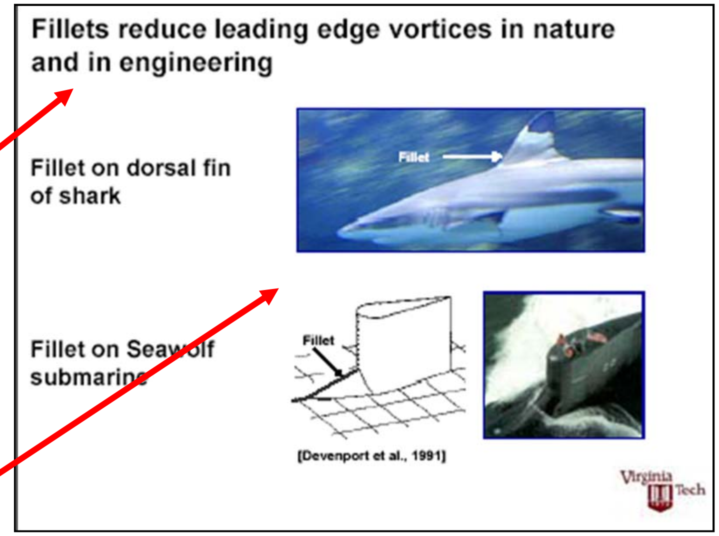
Note e-mail and web link

hertzog@uiuc.edu Copy of talk: www.npl.uiuc.edu/~hertzog/ASPENg2.pdf

Tips for preparing your talk (cont.)

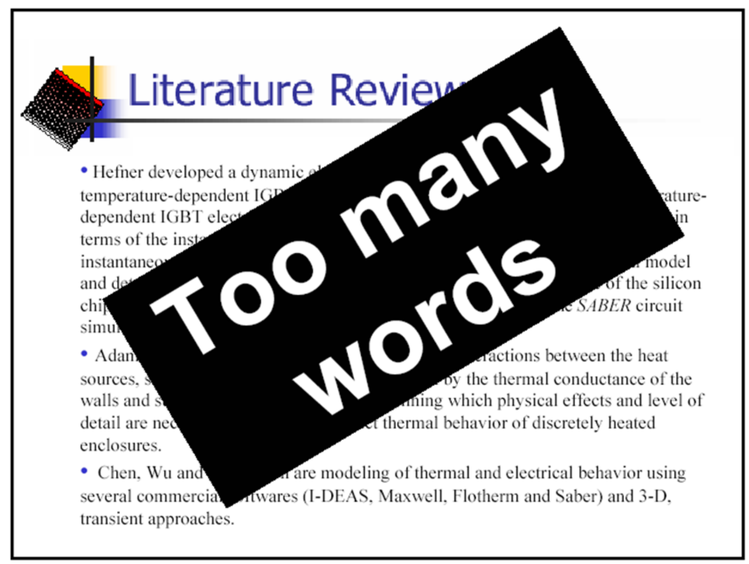
Have only 1 idea per slide

Use the header to state the main idea of the slide, and use the body of the slide to support that idea



Use well-labeled graphs and figures to illustrate your key points…this makes the slide more real and interesting to the audience

Avoid too much text….



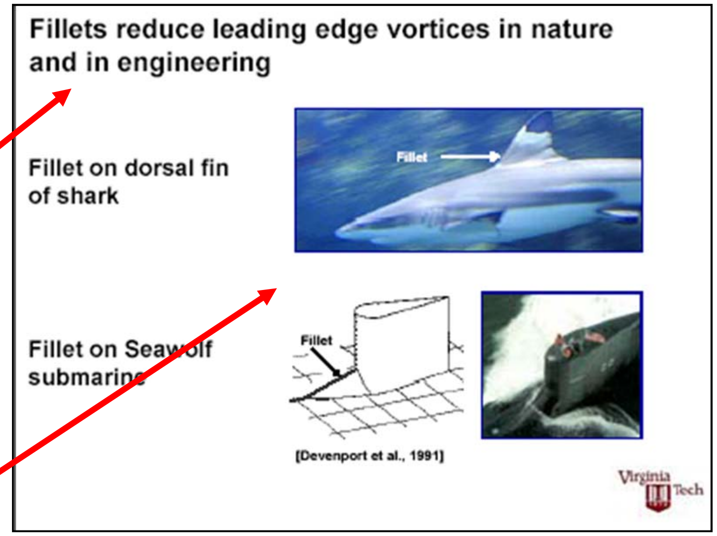
Tips for preparing your talk (cont.)

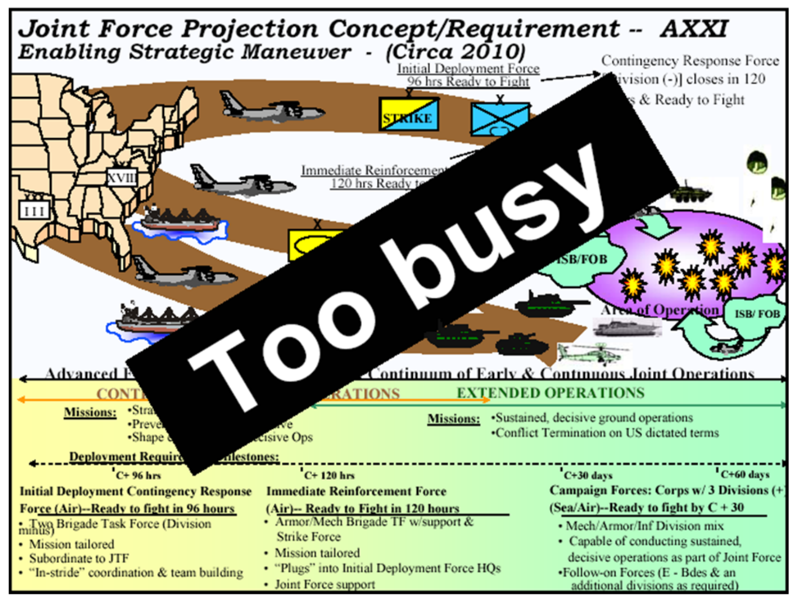
Have only 1 idea per slide

Use the header to state the main idea of the slide, and use the body of the slide to support that idea

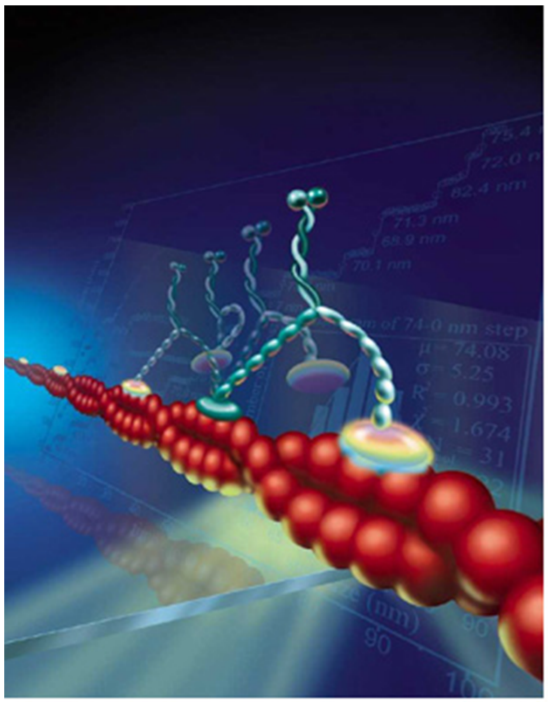
Use well-labeled graphs and figures to illustrate your key points…this makes the slide more real and interesting to the audience

….or too many distracting images





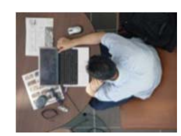
Use figures to illustrate your key points



Myosin “walking” on actin
Courtesy of P. Selvin

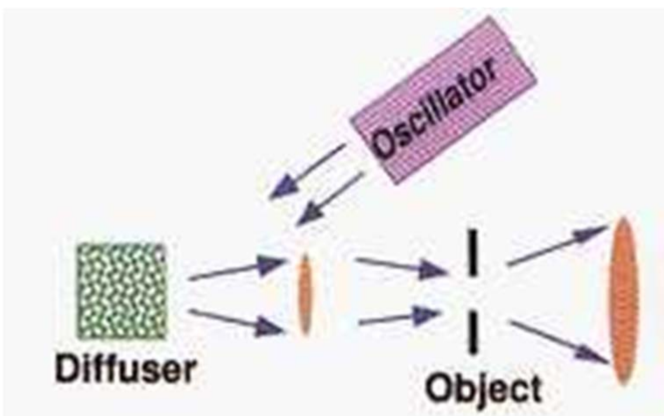
Figures:

- enliven slides
- promote audience interest
- provide supporting evidence for key points
- help explain complex ideas and relationships quickly
- show how things work, etc.

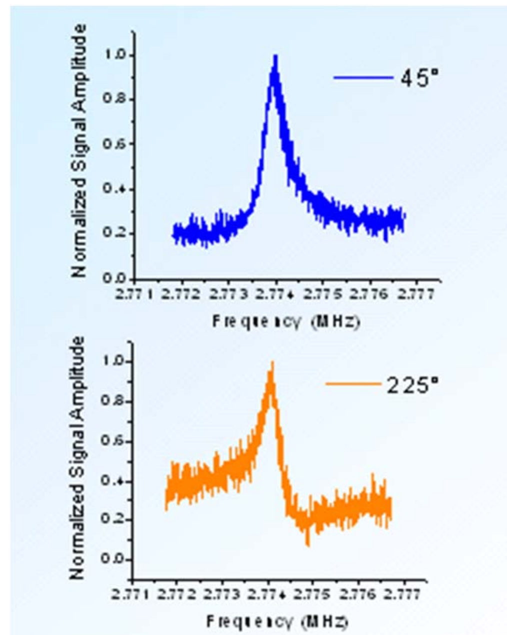


Label all elements in a figure

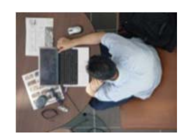
- Point out important features
- Label both axes of graphs and show units
- Provide a brief caption
- Give credit to source



The Nike laser system uses discharge pre-amplifiers.
(Courtesy US Navy)

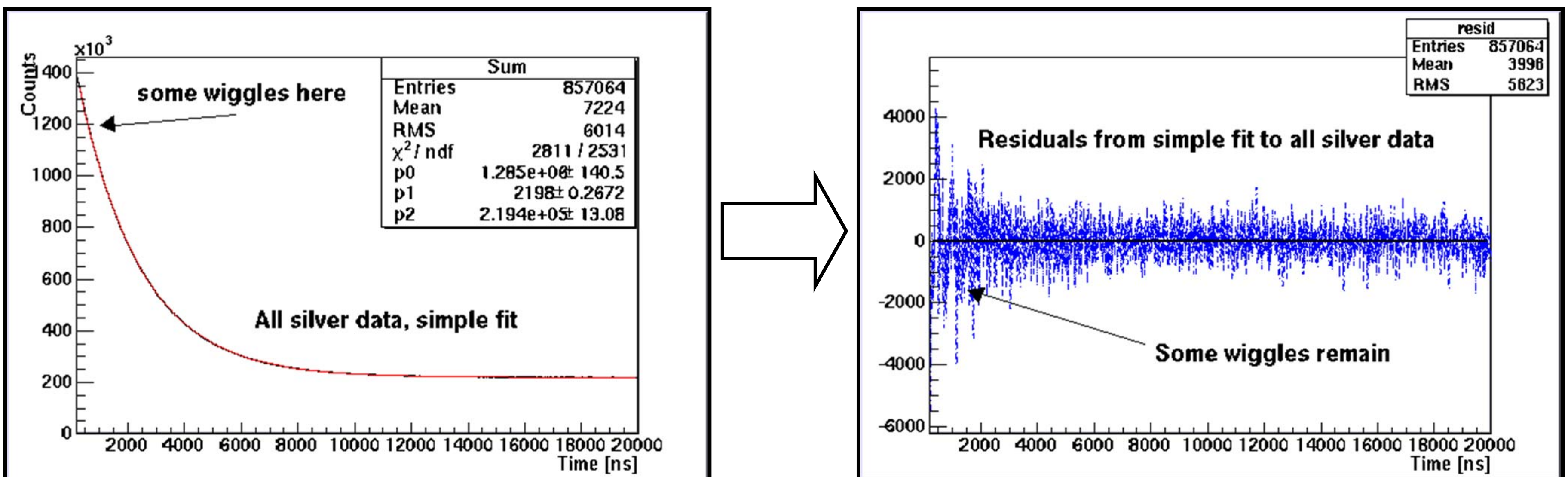


Sample normalized signals from the two-beam optical drive.
(Courtesy C. Michael)



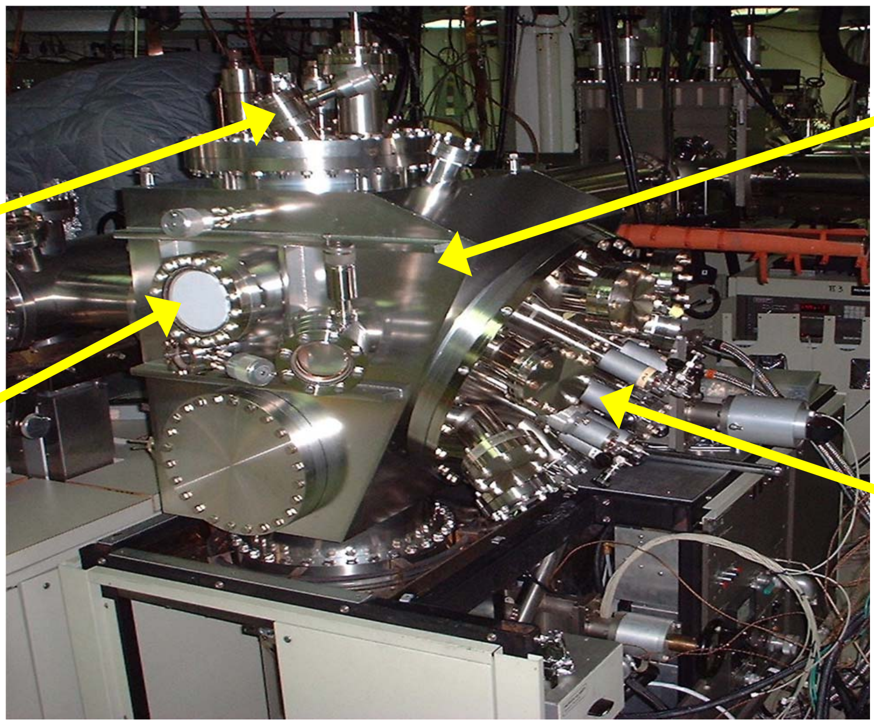
Presenting data is your most important and challenging task

- **Avoid copying a graph from a formal article – they have a different style, e.g., labels are too small**
- **Use color and make lines thick, labels legible**
- **Label axes and annotate important points with arrows and add words**
- **Use tables sparingly – if used highlight important parts**



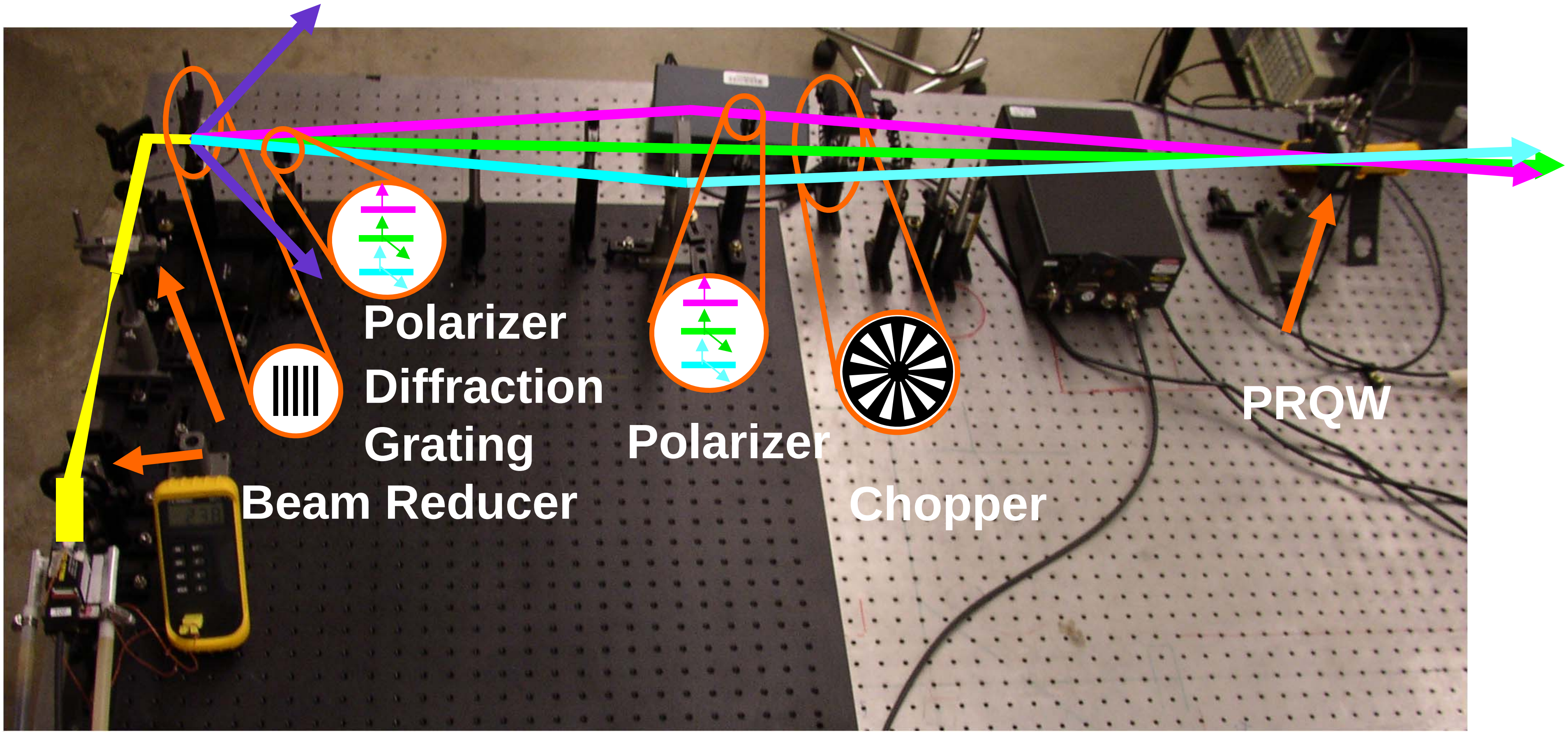
Show the equipment IF it helps as part of your proof – but sparingly, not just because you love it

- **Photographs** give scale and reality – but add labels
- **Schematics** provide concept
- **Diagrams** strip away unnecessary details
- **ALL OF THESE** can be useful in combination



OK, but could be better

Experimental Apparatus

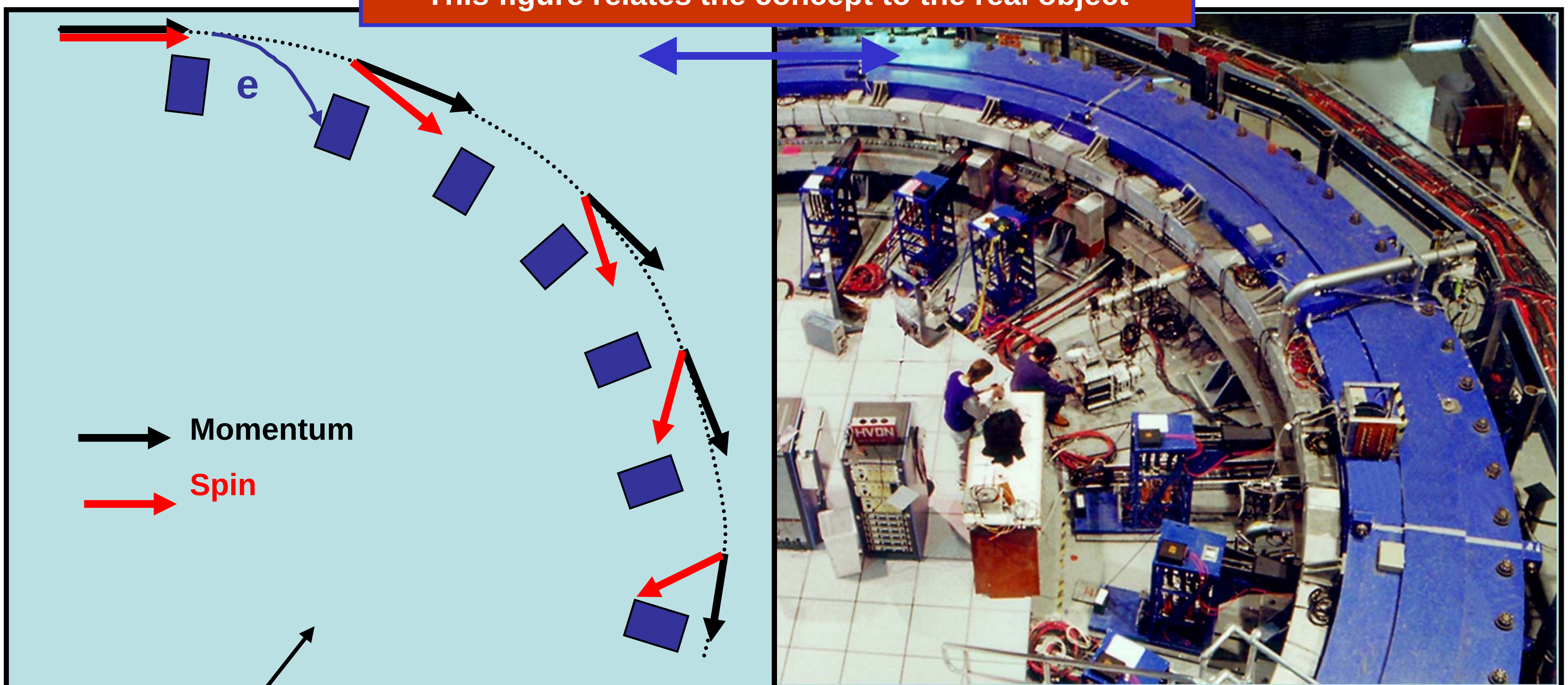


Here we add detail to picture of the optical bench—much more useful

The title is the conclusion of this slide

a_μ is proportional to the difference between the spin precession and the rotation rate

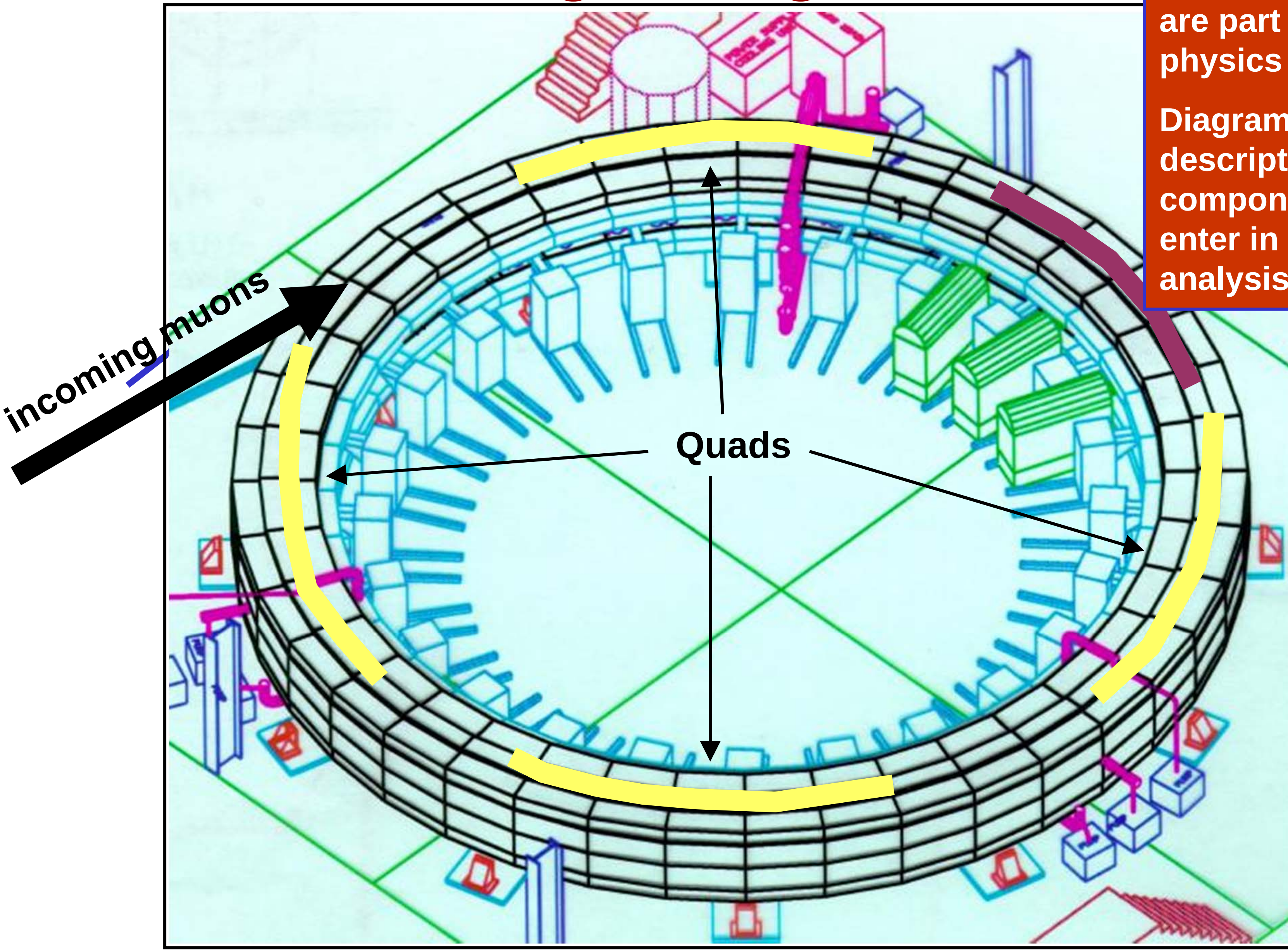
This figure relates the concept to the real object



$$\Delta\omega = \omega_a = \left(\frac{g-2}{2}\right)\frac{eB}{mc}$$

This supports assertion in sentence headline

BNL Storage Ring



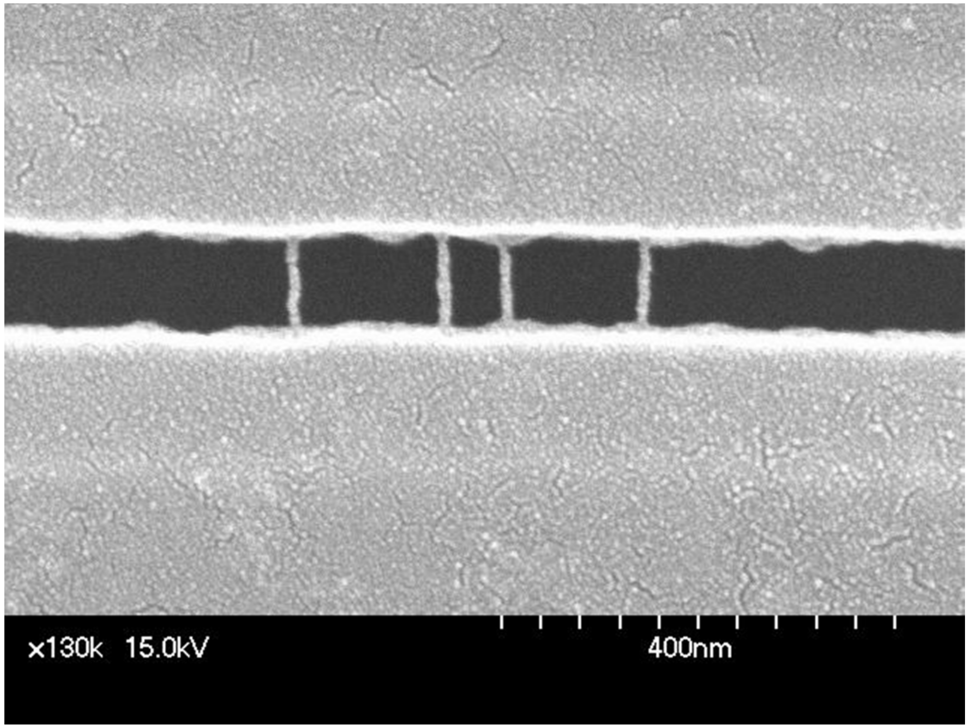
Features:

Blue/Black circles are part of the physics story

Diagram allows description of components that enter in the data analysis

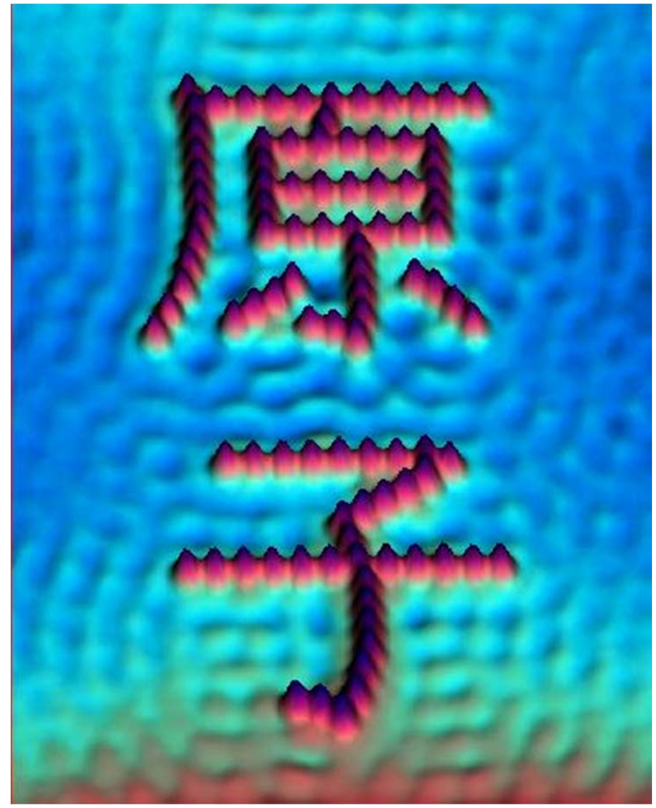
Some more examples of data

A photograph, which reveals the detail



10 nm wires: AuPd on DNA

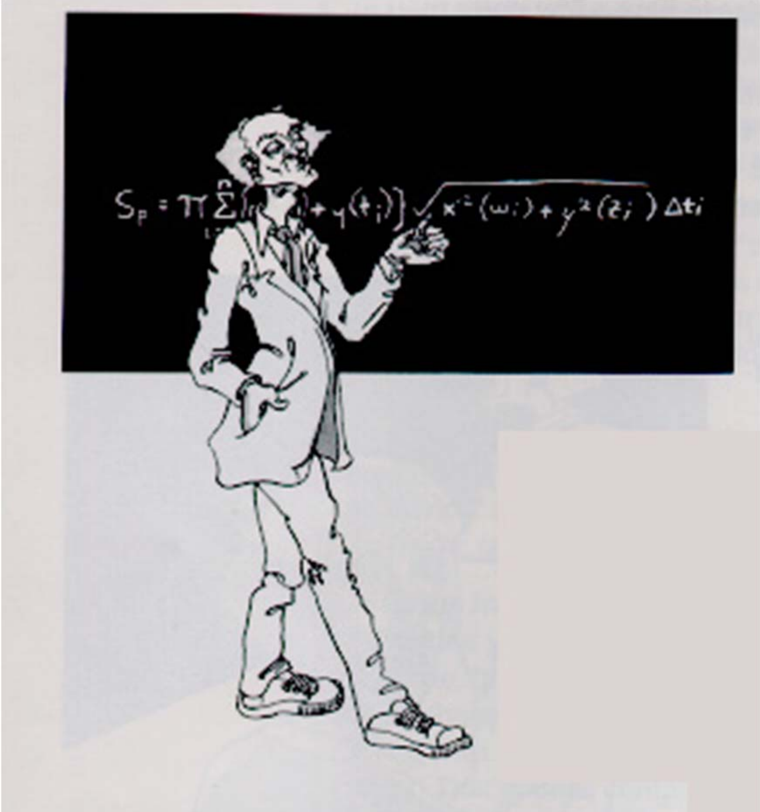
A photograph, which reveals the detail



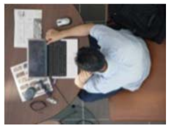
Make sure you provide something to show scale, and include a short caption to explain what the audience is looking at

Use equations sparingly

- Use equations only when necessary
- If you use equations
  - Slow down
  - Talk through step by step
  - Explain relevance
  - Combine with a picture that illustrates the physical principle involved



If you must use mathematics in your presentation, slow down, and talk the audience through each equation...



I think this is a great and effective example of introducing an equation from one of our students

The Radiative Transfer Equation

Number of Photons

Density of Dust Grains

$$\frac{dI}{ds} = -In(q_a + q_s) + \Im$$

Source Function

Distance Traveled

Absorption Coefficient

Scattering Coefficient

(from geometry and composition of dust grains)

Requirements to solve analytically:

- *n* is a constant
- $q_a = 0$ or $q_s = 0$

We want turbulent clouds. *n* is not a constant

Bad equation example:

Disaster ?

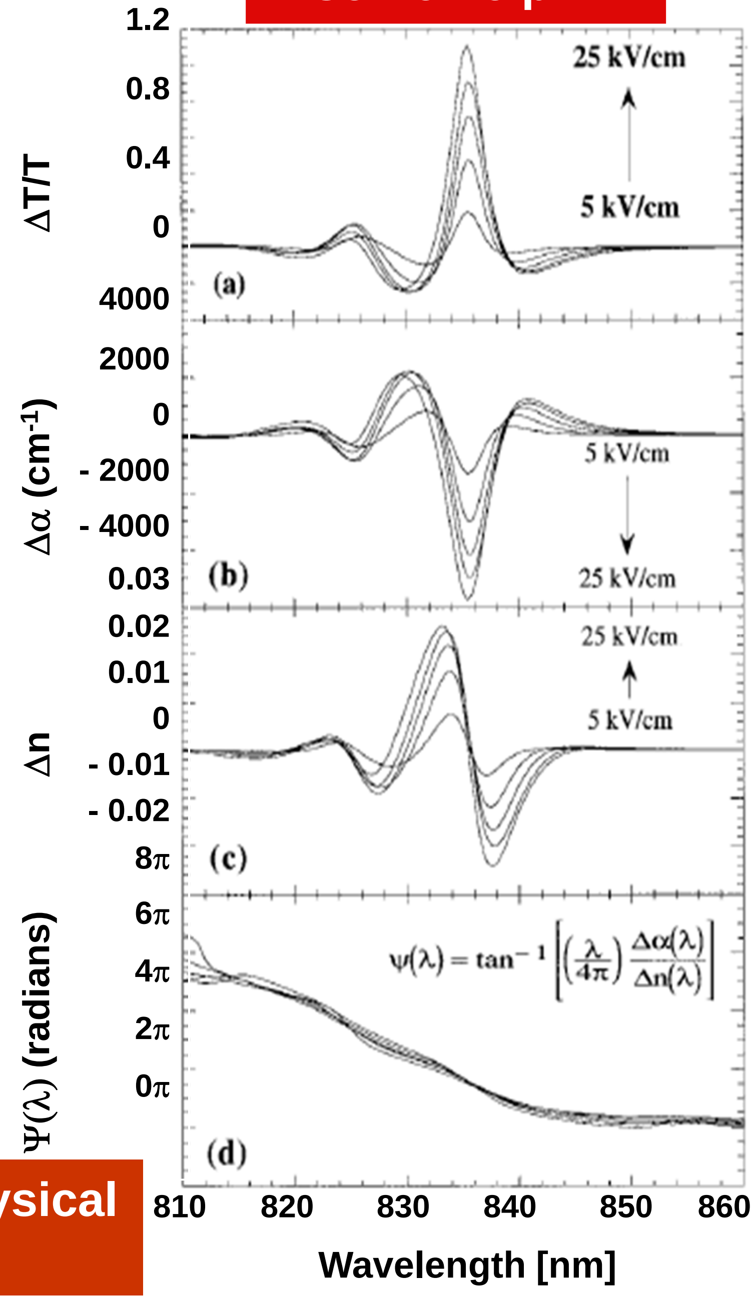
$$\frac{\Delta T}{T} = \frac{T(hv,F_o) - T(hv,0)}{T(hv,0)}$$

$$\Delta\alpha(hv,F_o) = -\frac{1}{L}\ln\left(1+\frac{\Delta T}{T}\right)$$

$$\Delta n(\lambda) = \frac{\lambda^2}{2\pi^2} P\int_0^\infty \frac{\Delta\alpha(\lambda')d\lambda'}{\lambda^2 - \lambda'^2}$$

$$\psi(\lambda) = \tan^{-1}\left[\left(\frac{\lambda}{4\pi}\right)\frac{\Delta\alpha(\lambda)}{\Delta n(\lambda)}\right]$$

Data provides some help…



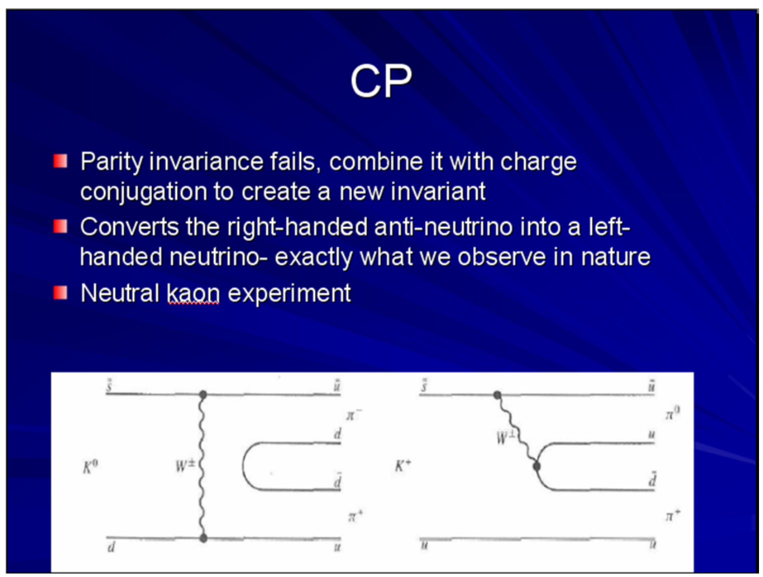
What does this mean? Better to provide a physical interpretation in words next to equations

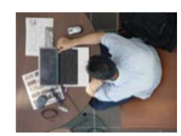
Remember, your goal is to convey your ideas, so avoid distracting text and effects!

Don’t overuse PowerPoint animations and sounds!

Make sure there is good contrast between text and background

Use simple (or no) backgrounds on slides





Eschew weird fonts

Don’t use *calligraphy* or serif fonts

USE THE SAME FONT THROUGHOUT THE TALK

Make all text at least 20 pt

Use San Serif Fonts

Use San Aarif font (e.g., Ariel)

O

Not Sarif font (e.g., Times New Roman)

O

Skinny parts disappear when projected

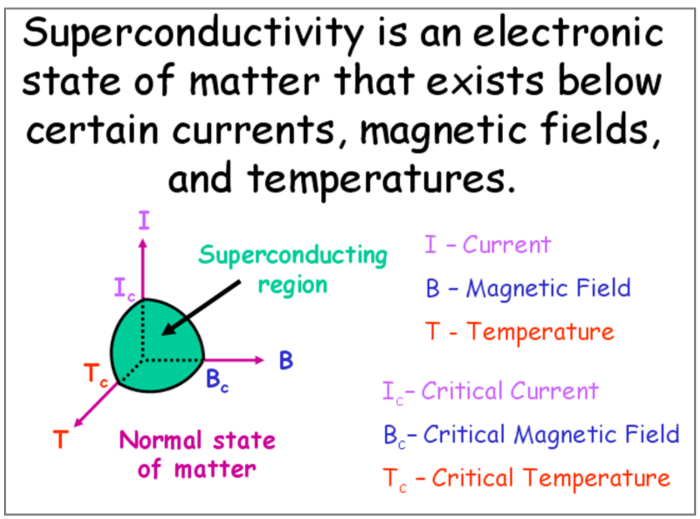
Use "normal" colors

DON'T use red/green or red/blue as contrasting colors

Make sure colors looks the way you expect using an LCD projector!

Avoid neon colors and pastels

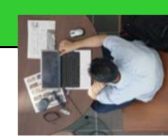
Don't use many random colors; people expect color to *mean* something



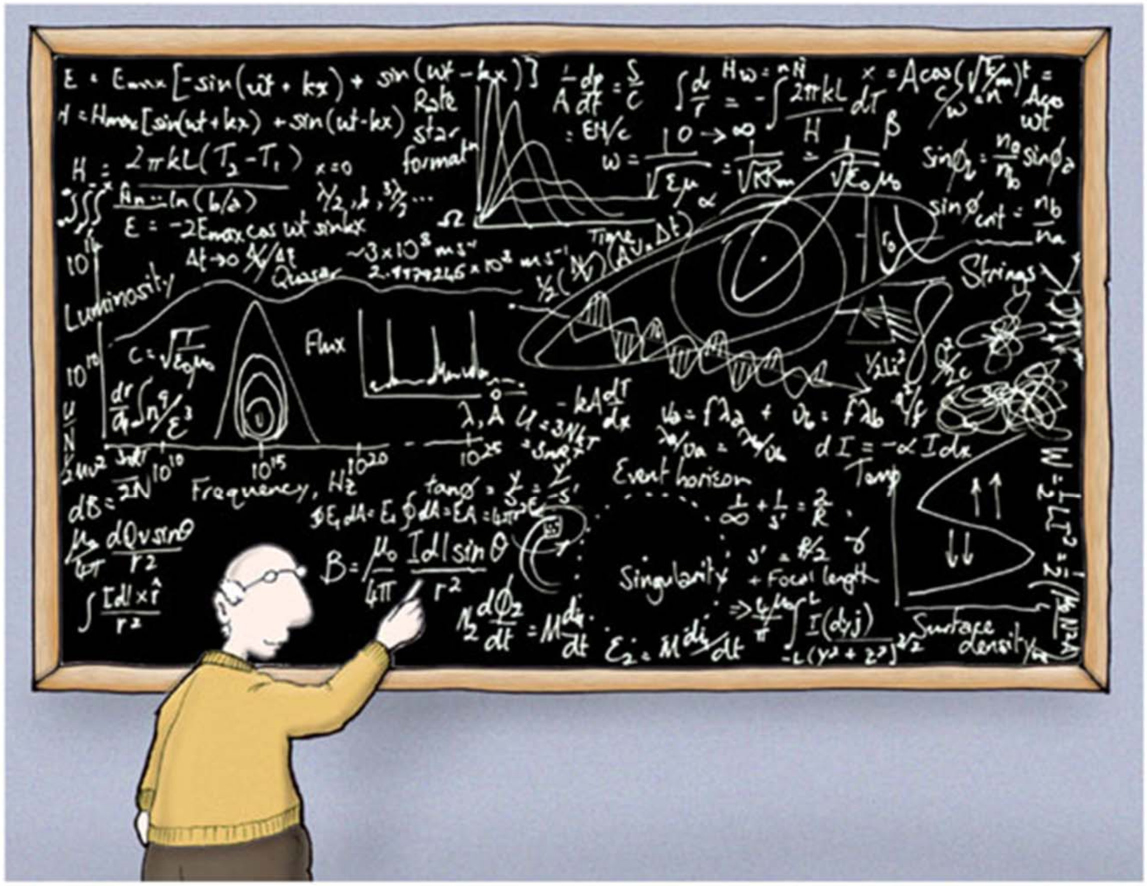
Strive for easy reading

Strive for easy reading

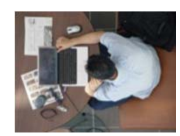
Strive for easy reading



Tips for giving a scientific presentation



Astrophysics made simple



Pointers for giving the best possible talk:

Maintain eye contact with audience

Don’t stare at screen or monitor

Do not read your talk!

Avoid nervous mannerisms

Pacing, bobbing, waving arms, jingling coins

Use laser pointer or stick directed at screen

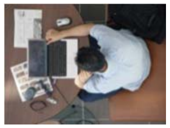
Don’t point directly at overhead on projector

Don’t block the screen

Train yourself to speak slowly and distinctly—practice!

Avoid “fillers”: “uh”, “like”, “um”, “okay”

Be enthusiastic!



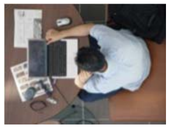
If you don’t act excited by your results, don’t expect the audience to be!

Pointers for giving the best possible talk:

Don’t show any material on slides (e.g., figures, equations, text, etc.) you can’t explain!!

Rehearse how you’ll end your talk

- Don’t end with “Well, I guess that’s it…”
- Don’t just stop and let the committee guess that you’re done
- Thank the audience!



The best way to prepare for a talk is to <u>Know Your Material</u>

Practice, practice, practice

Focus on communicating, not performing

Humor is good, but don't overdo it

Keep it simple

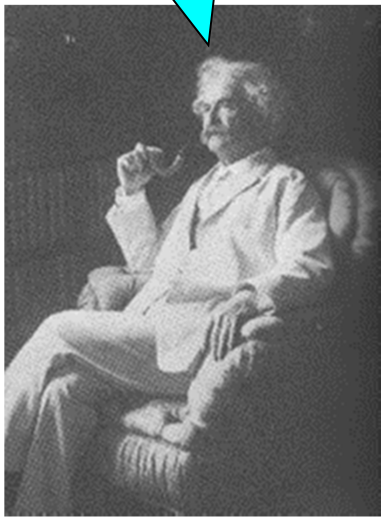
Prepare key phrases

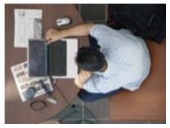
It's okay to write out material first
Write the key point to make for each slide
If the slide doesn't have a point, eliminate it!!!

Stay on track

Small (planned) digressions fine if motivated, but get back on track (shows you are paying attention to audience)

It takes three weeks to prepare a good ad-lib speech





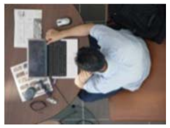
More advice…

Bring a copy of your slides if giving a PowerPoint talk

- this will help you practice
- you can distribute these to interested people

Make appropriate use of the screen:

don’t underfill the screen, and don’t put key information at the edges of the screen.



Rehearse Your Talk!

A few days before

- Practice in front of friends and check timing
- Rehearse likely questions
- Solicit feedback about logic and clarity
- Revise (*shorten*)

The night before

- Go over one more time
- Put all materials *in order* (number your slides!)

Prof. Per Ahlberg delivering the Presentation Speech for the 2001 Nobel Prize in Chemistry at the Stockholm Concert Hall.

Check *everything* just before your talk

Check the projector

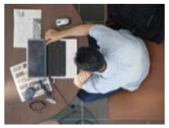
- Make sure you know how to turn it on
- See that it is plugged in
- Check which way to position your slides
- Adjust the focus

Check microphones, pointer, other tools

Arrange your slides, notes, and other materials

- Be able to reach everything without moving
- Be able to go through your slides without fumbling

Have a watch handy to check the time



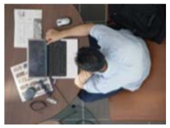
“Stage Fright”? Be Prepared!

Know your subject thoroughly

- Practice in a big room in front of real people
- Have all your materials in order
- Arrive early
- Familiarize yourself with the equipment

Ask a friend to sit in the middle of the audience and speak primarily to him or her

- Tell him to look interested and nod frequently
- Ask her to smile and nod encouragingly whenever she catches your eye



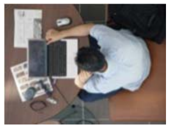
Non-Native (and Native!) English Speakers:

Do not use slang or ‘laboratory’ terms

Choose the simplest word

Have a native speaker listen to a rehearsal and review your slides

Speak slowly and distinctly



Handling questions is an essential part of giving a talk

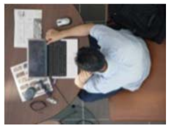
As part of preparing your talk, try to anticipate questions you might get

In each slide, try to identify what the weak points are, what questions you might ask, etc.

Be prepared to repeat simple derivations of equations or estimates presented on your slides

If you don't know the answer?

Say "That's an excellent question. I'm not sure; I'll have to look into it" or "Let's talk about it afterward"



Express your thanks

At the beginning of your talk

Acknowledge colleagues and collaborators who contributed to the work

At the end of the talk

Thank your committee for their attention