



# Physics 496

## Introduction to Research

Lecture 5.0: Effective Scientific Presentations

Lance Cooper, Celia Elliot, Dave Hertzog, Al Nathan,  
Tony Liss

# This is an outline

You should always have one

- Different types of presentations
  - Know your audience and your goal
- Organizing your talk
- Conveying information
  - Using figures, tables and equations
- Powerpoint aesthetics
- Practicing your talk
  - Don't under practice
  - Don't over practice
- Delivering your talk

# Why are presentations necessary?

## **Publications lag months/years behind results**

Talks at scientific meetings are current!!

Talks at scientific meetings allow interaction with your scientific community.

## **Presentations can accentuate results/ideas**

Talks before your research group, collaboration meetings.

## **Your future job will require presentations**

You will give talks as a job candidate.

You will give presentations as an employee.

You will give presentations as an instructor.

You will give presentations to the funding agencies.

# Answer 4 strategic questions



**What is your goal in giving this talk?**

**Who's your audience?**

**How much time do you have?**

**What key points do you want the audience to take away?**

# What is your goal?



Persuade collaborators your analysis is correct

Disseminate your results

Teach the audience something

Learn something from the audience

Gain the respect of the community

Establish future collaborations

Get a job or secure funding

Learn something yourself—gain a new perspective on your work

# Who is the audience?

- Don't over-estimate what the audience knows.
  - ❖ Audiences rarely mind being told things they already know.
  - ❖ Assuming they know something they don't should be avoided.
- How large is the audience?
- What two or three key points from your talk should they take home?
- What background information do they need so that they can understand these points?



# Don't run over!

Know how much time you have and **STICK TO IT**.  
This requires experience *and practice*.



# What are the key points?

Write down the 2–3 key ideas you wish to convey!

The introductory material flows from these ideas  
(what background/motivation does the audience  
need?)

The body of the presentation flows from these ideas  
(what supporting evidence, figures, and data do you  
need to present?)

# How do I start?

- Start with the 2-3 key points, then
  - ❖ Motivate the key issues (Introduction)
  - ❖ Preview your main messages  
tell them what you're going to tell them
  - ❖ Provide support for your messages (Body)  
tell them
  - ❖ Summarize your messages (Conclusion)  
tell them what you told them



# Organizing your talk

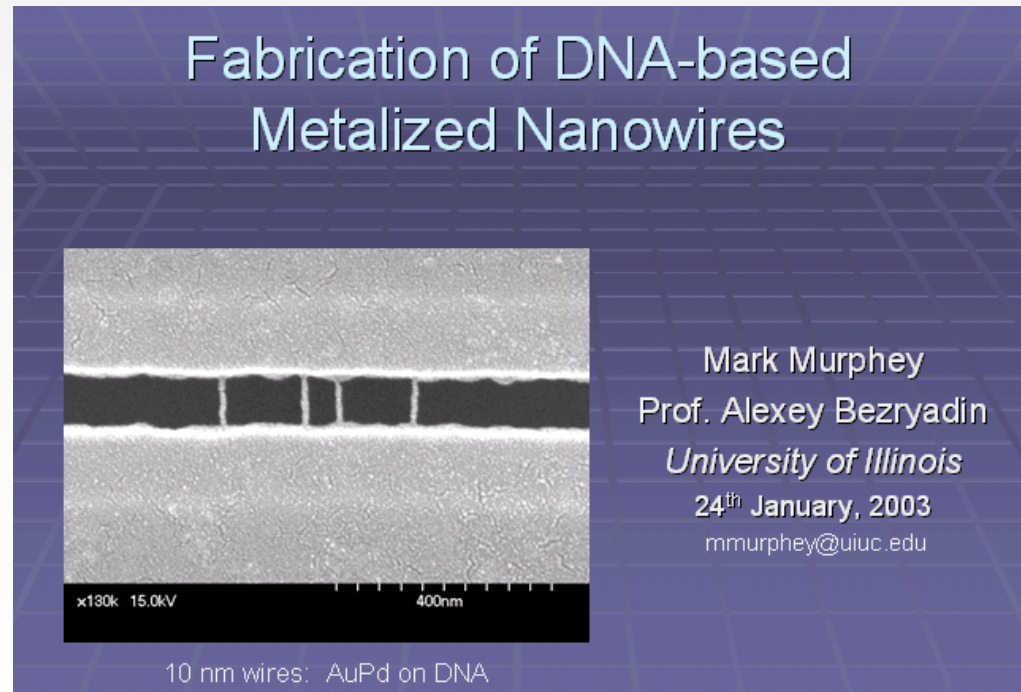
The title slide and outline prepares the audience to listen and tells them what to look for

## Title slide

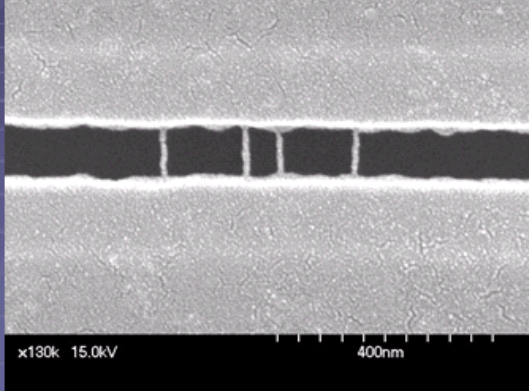
Your name and affiliation

Venue and date

Attention-getting graphic



Fabrication of DNA-based  
Metalized Nanowires



Mark Murphey  
Prof. Alexey Bezryadin  
*University of Illinois*  
24<sup>th</sup> January, 2003  
mmurphey@uiuc.edu

10 nm wires: AuPd on DNA

A dark background with colorful, streaky patterns representing particle tracks in a detector. The tracks are primarily blue, green, and yellow, with some pink and red highlights. They appear to be moving from the top left towards the bottom right, with some branching or interaction points.

# After the Higgs

Tony Liss

Physics Department Colloquium  
February 6, 2013

# Organizing your talk

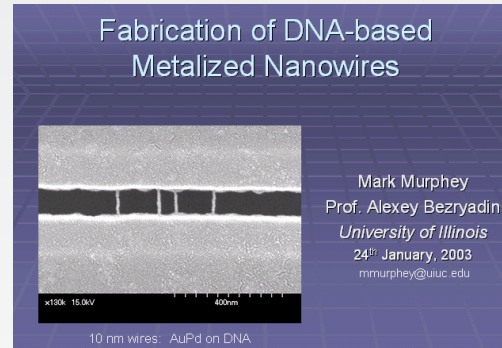
The title slide and outline prepares the audience to listen and tells them what to look for

## Title slide

Your name and affiliation

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 three or four for a 20-minute talk)

# Particle Physicists Ask ...

## 1. Why matter?

- CP Violation

## 2. Why mass?

- Higgs field

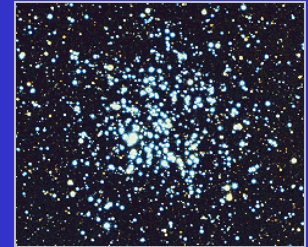
## 3. Why this standard model?

- SUSY or other extensions

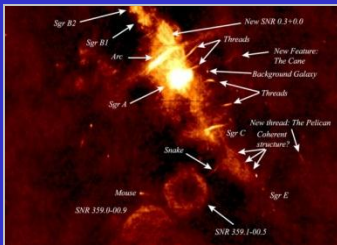


# Overview

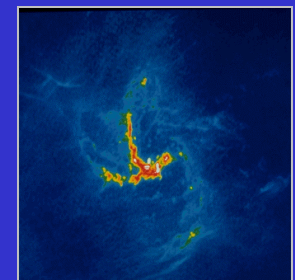
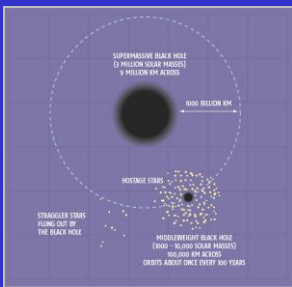
Black holes and star clusters



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 slide

## Method

1–2 slides

## Results

4–6 slides

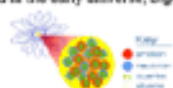
## Future work

1–2 slides

# slides are guidelines only, you can and will adapt them with experience (and scale them depending on length)

**What's this all about?**

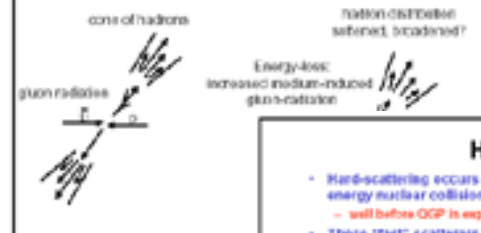
- **Quark Gluon Plasma (QGP)**
  - hypothesized state of deconfined quarks and gluons
  - expected in the early universe, big-bang stage



- this represents a phase change
- like "melting" a nucleus

**pp vs A-A collisions**

hard-scattered particles out out	hadronized
cone of hadrons	hadron distribution
gluon radiation	softened, broadened?
	Energy-loss: increased medium-induced gluon-radiation



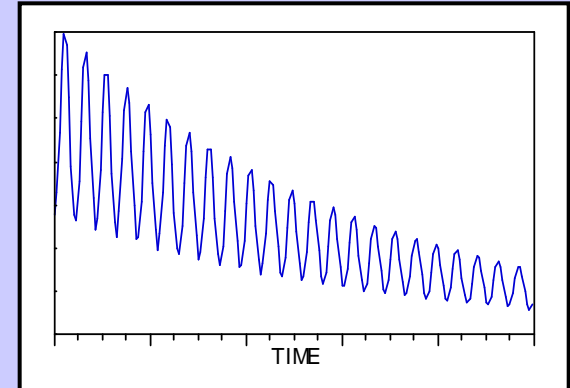
**High  $p_T$**

- Hard-scattering occurs at earliest times during a high-energy nuclear collision
  - will be before QGP is expected to form (equilibrate)
- These "fast" scatterers will experience the strongly interacting medium created in the collision
- They will lose energy in the hot, dense medium (by gluon bremsstrahlung) and their outgoing energy distribution will be modified downward
- Net effect, depletion in yield of high  $p_T$  particles compared to p-p case
- The game is then to make the comparison carefully

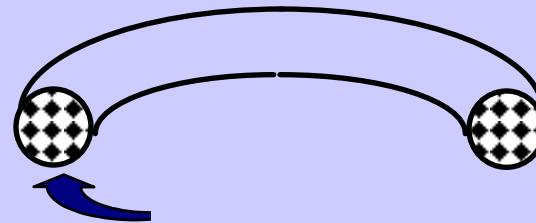
Superb slide! This explains in pictures and very few words the essence of the experiment. Note the schematic equation.

# We measure

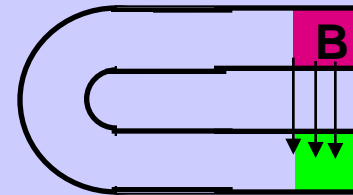
(1) Precession frequency



(2) Muon distribution



(3) Magnetic field map



$$(g - 2) \propto \frac{(1)}{\langle \int (2)(3) \rangle}$$

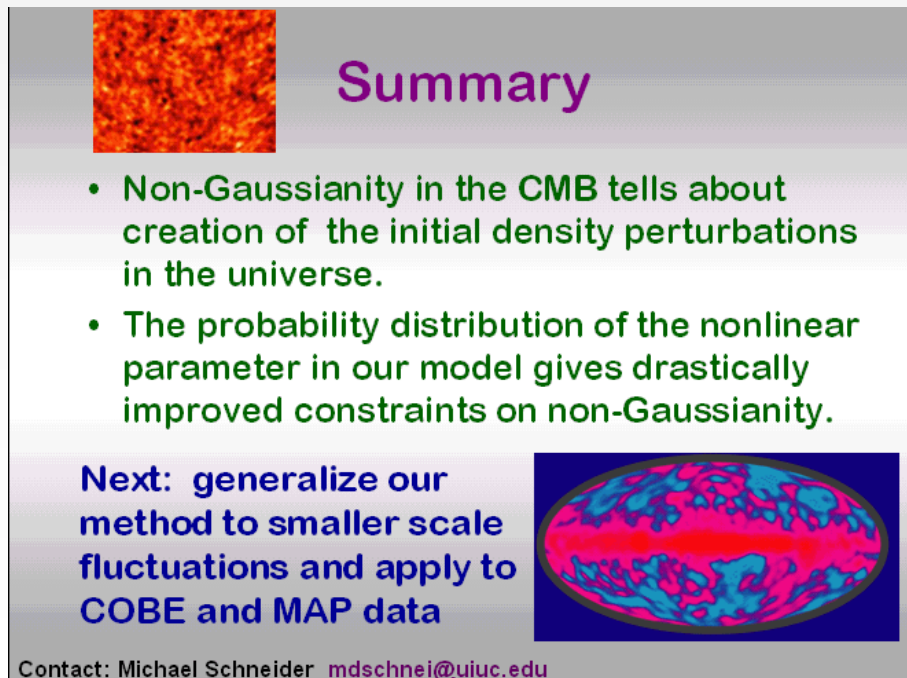
Double Blind Analysis

# Provide a summary slide

**Recap key results**

**Reiterate principal conclusions**

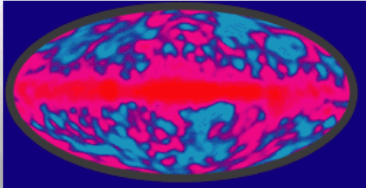
**Repeat your contact information**



**Summary**

- Non-Gaussianity in the CMB tells about creation of the initial density perturbations in the universe.
- The probability distribution of the nonlinear parameter in our model gives drastically improved constraints on non-Gaussianity.

**Next: generalize our method to smaller scale fluctuations and apply to COBE and MAP data**



Contact: Michael Schneider [mdschnei@uiuc.edu](mailto:mdschnei@uiuc.edu)

The image shows a slide titled 'Summary' with a red and orange textured background. It contains two bullet points in green text. Below the text is a blue and red map of the CMB. At the bottom left, there is contact information for Michael Schneider.

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 we did

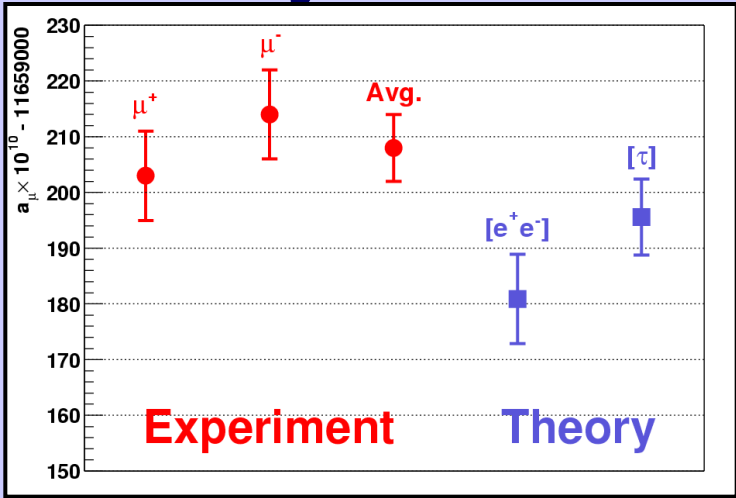
- Consistent results, consistently above theory
  - ❖ ee – tau controversy still quite active
  - ❖ considerably more “ee” type data on the way

Where we stand: summarized nicely on the plot

- The systematic limit is “far” away ...we should go there

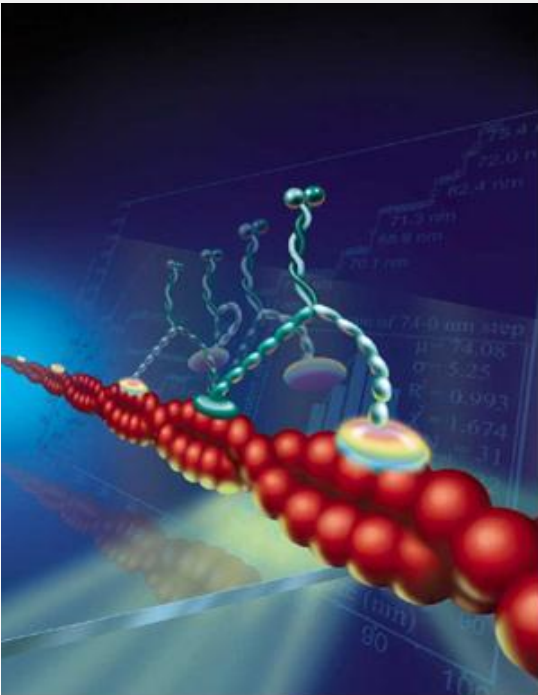
What to do next

Note e-mail and web link.



# Use figures to illustrate your key points

(and make your slides easier to look at)



Myosin “walking” on actin  
*Courtesy of P. Selvin*

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

# Remember what we said about figures?

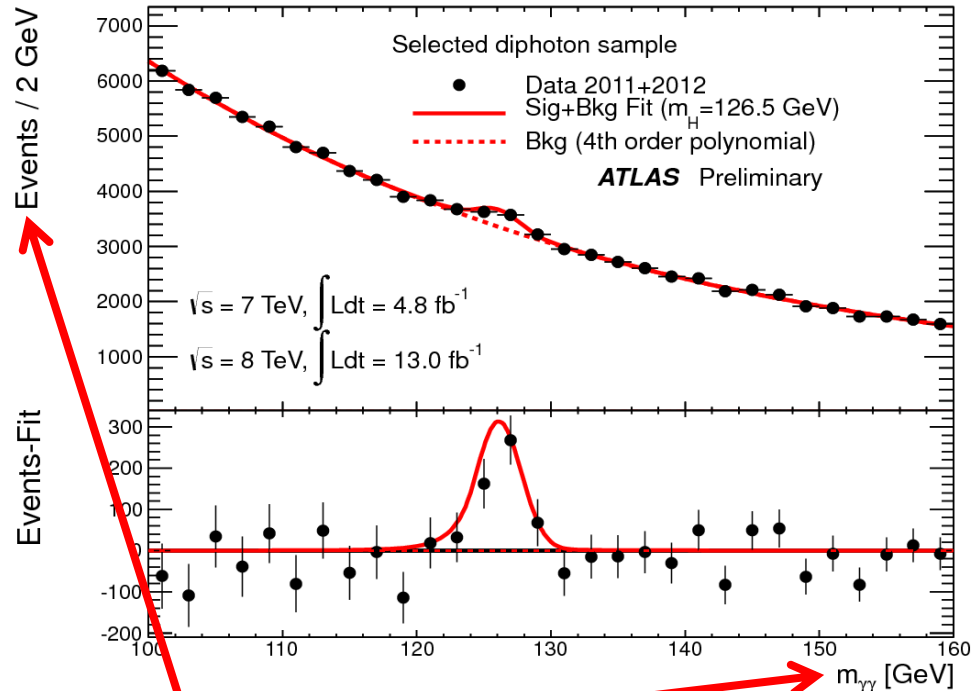
Point out important features

Provide a brief caption

Give credit if it's not yours.

Words on the slide should relate to information in the figure.

Not too much on one slide.

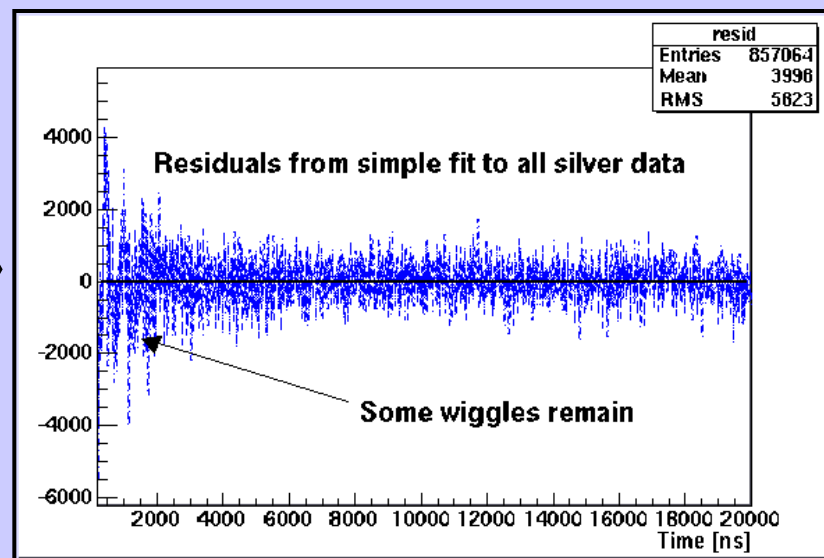
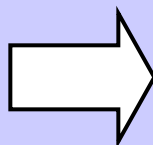
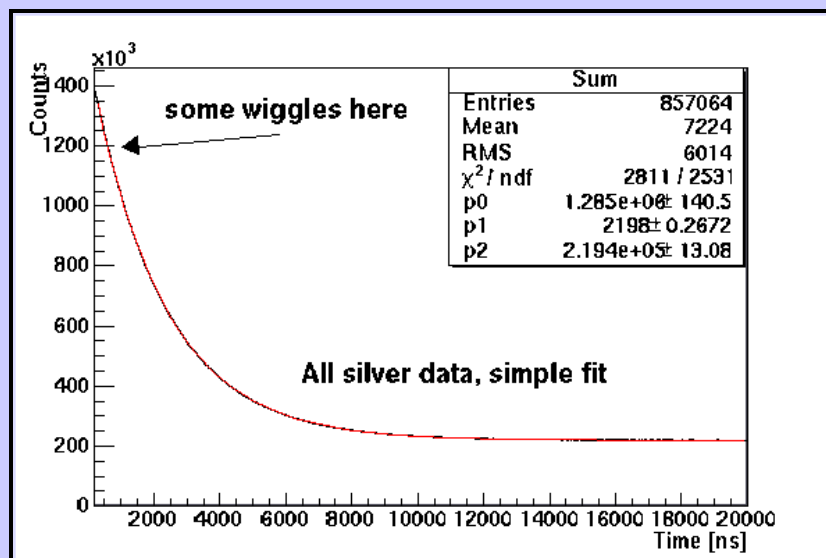


Labels & Units!

Invariant mass spectrum in 17.8 fb $^{-1}$  of ATLAS data showing the “Higgs” mass peak.

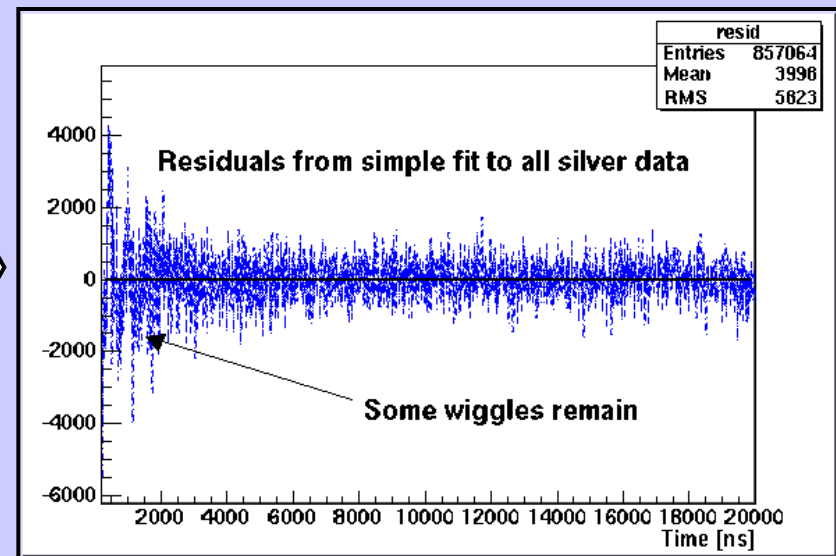
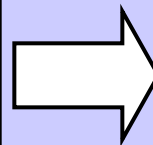
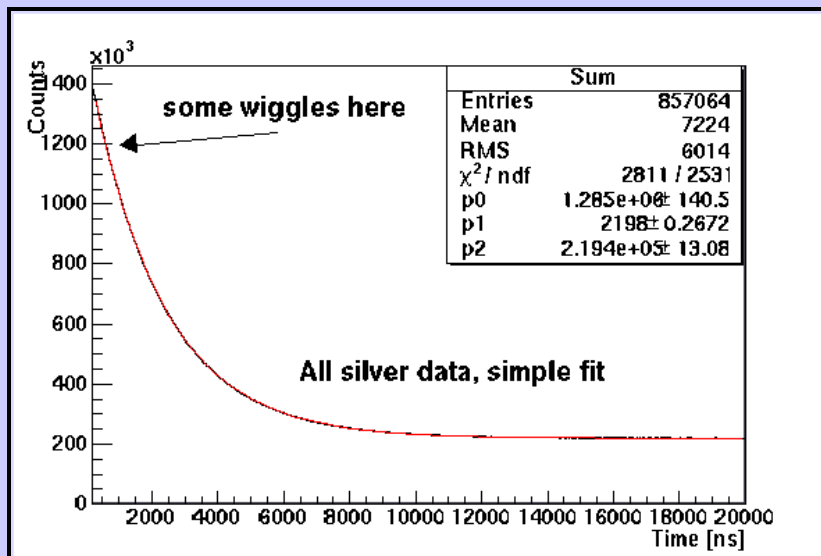
# Presenting data is your most important and challenging task

- Avoid copying a graph for a formal article – they have a different style
- Use color and make lines thick
- Label axes and annotate important points with arrows and add words
- Use tables sparingly – if you do, highlight



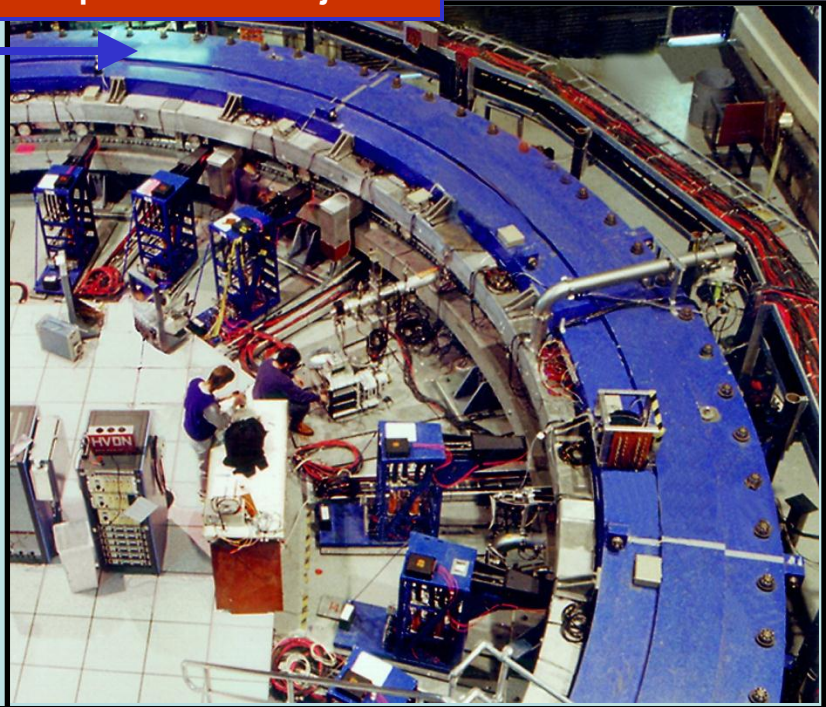
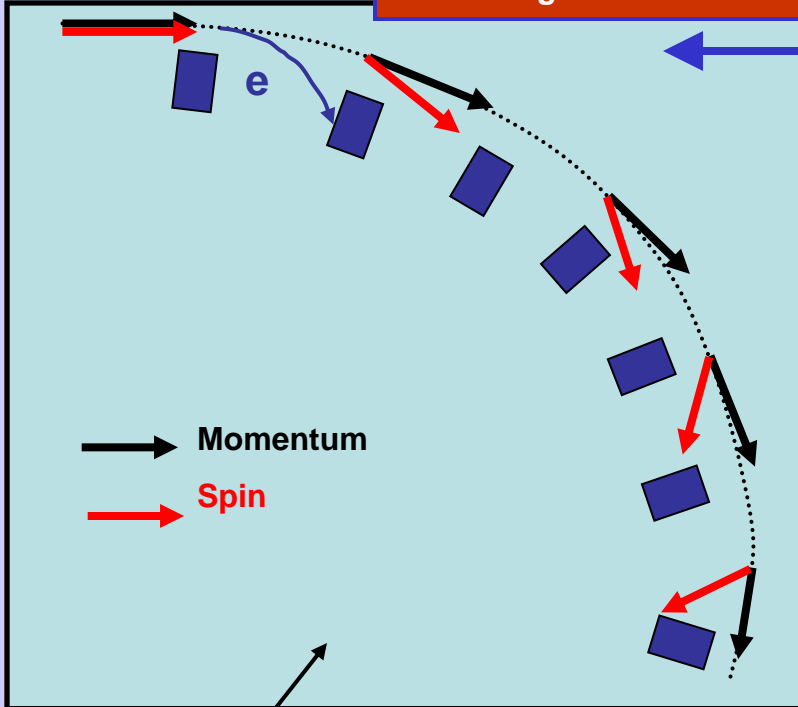
# Presenting data is your most important and challenging task

- What you show depends strongly on the audience
  - ❖ General audience: perhaps only left plot
  - ❖ Experts need to see the right plot too



# $a_\mu$ is proportional to the difference between the spin precession and the rotation rate

This figure relates the concept to the real object



This supports assertion in sentence headline

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

# Fit to Simple 5-Par Function

This slide follows from the previous one, telling a story.

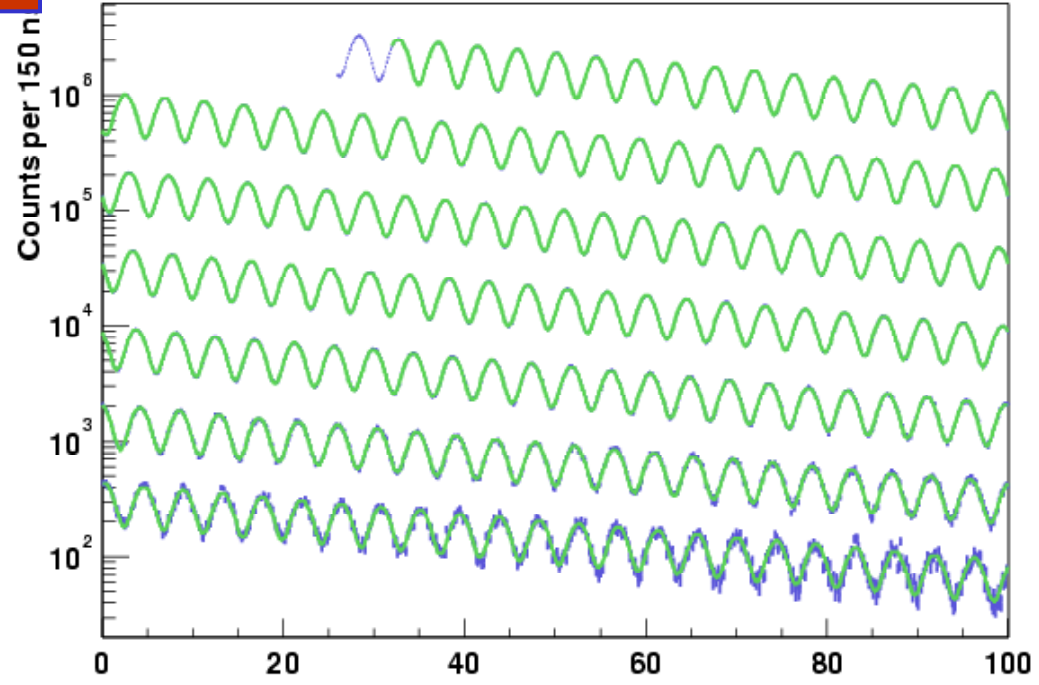
Equation uses COLOR to highlight the terms important to the talk

$$N(t) = N_0 e^{-t/\tau} [1 + A \cos(\omega_a t + \phi)]$$

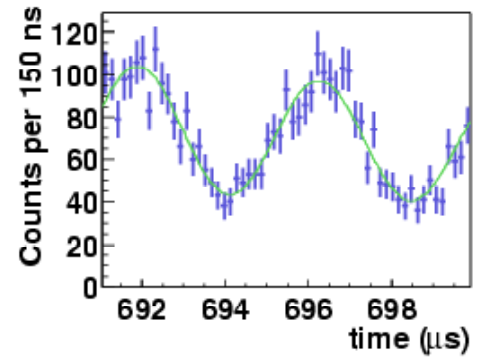
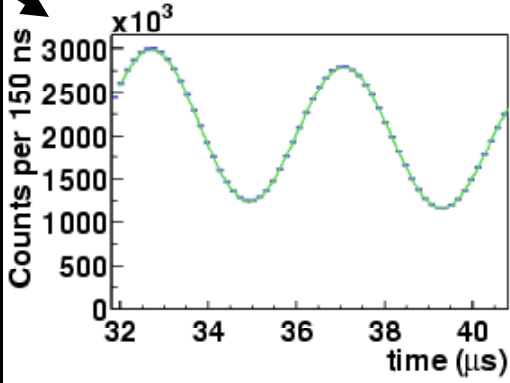
Few billion events

Getting a good  $\chi^2$  is a challenge

For a talk meant for experts, additional slides will follow...



Blowups provide extra detail



# Experimentalists, show thy detector?

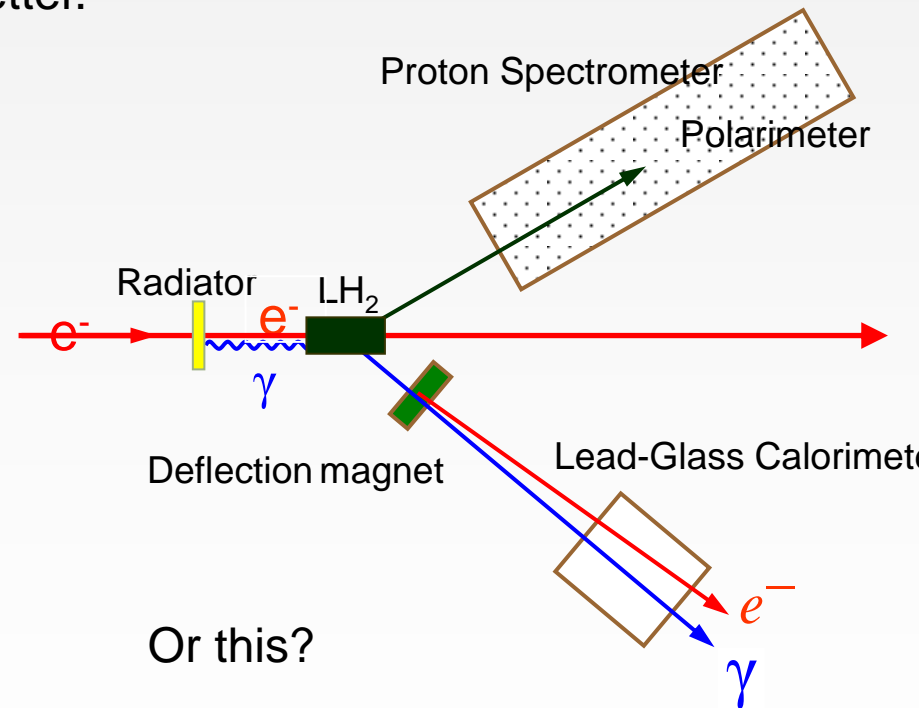
Only if

- a) It's really awesome.
- b) It really helps tell the story

Otherwise a schematic is probably better.

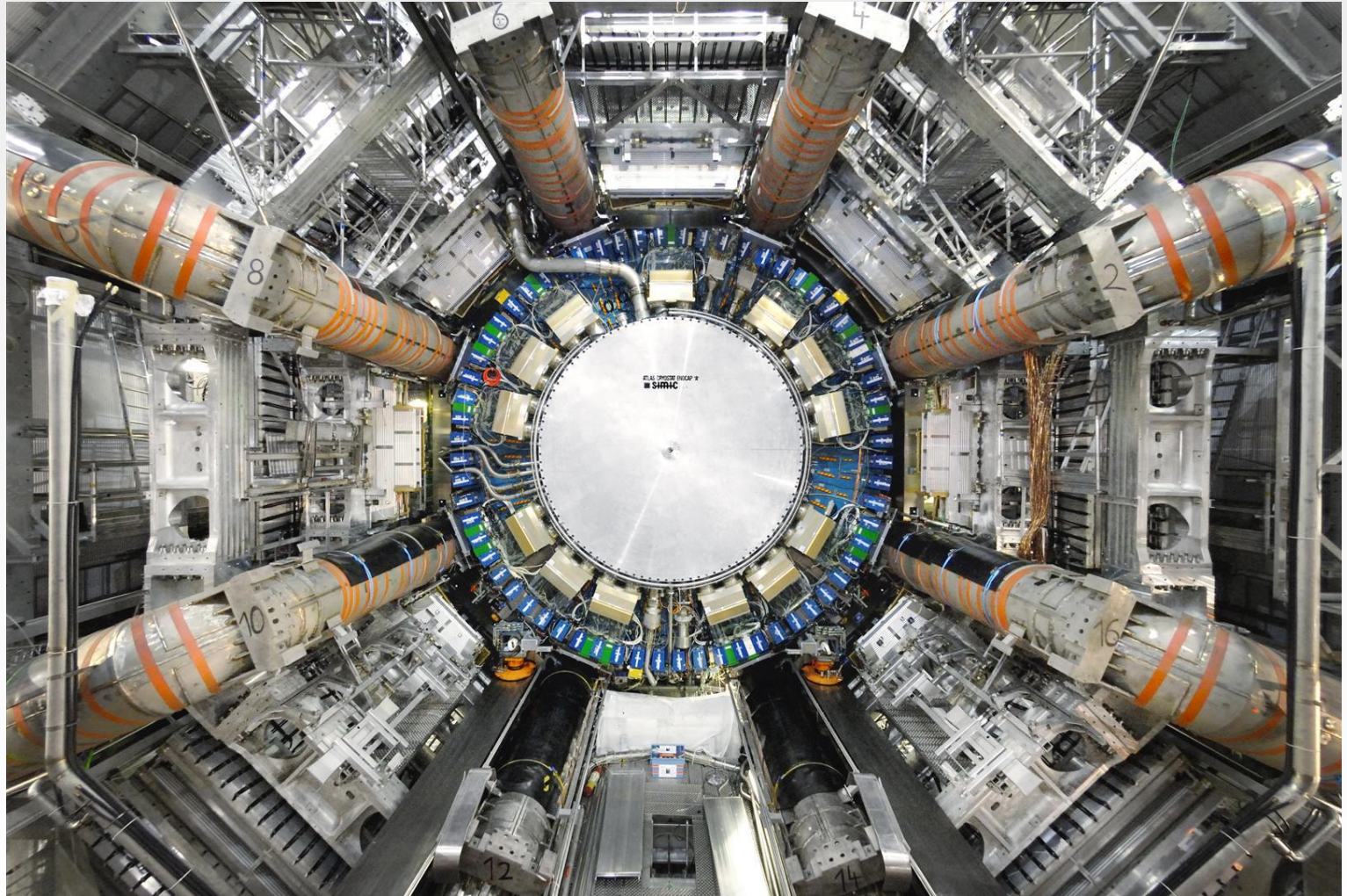


This?



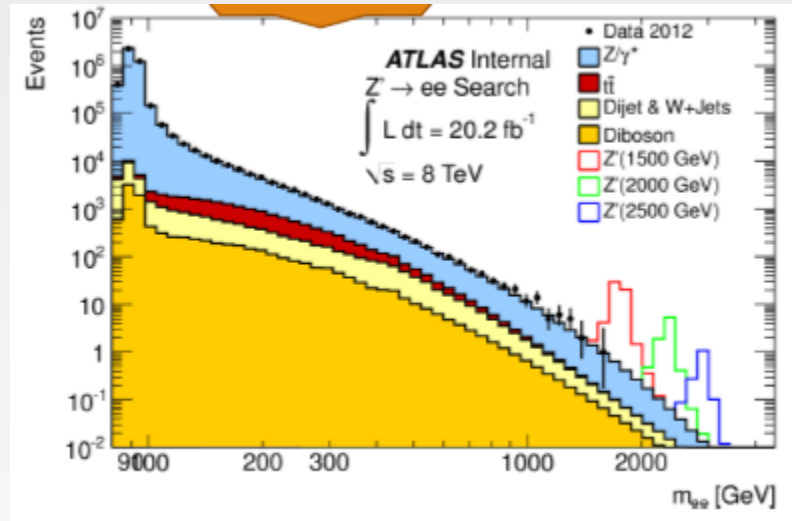
Or this?

But if it's awesome...



# Use graphs and tables to present numerical data

But not too dense!



This table is too dense for a talk

$m_{ee}$ [GeV]	110 - 200	200 - 400	400 - 800	800 - 1200	1200 - 3000	3000 - 4500
Z / gamma	$119000 \pm 8000$	$13700 \pm 900$	$1290 \pm 90$	$68 \pm 6$	$9.8 \pm 1.1$	$0.008 \pm 0.004$
tt	$7000 \pm 800$	$2400 \pm 400$	$160 \pm 60$	$2.5 \pm 0.6$	$0.117 \pm 0.034$	$0.0000171 \pm 0.0000100$
Diboson	$1830 \pm 210$	$660 \pm 160$	$93 \pm 33$	$4.8 \pm 0.8$	$0.79 \pm 0.26$	$0.005 \pm 0.004$
Dijet, W+jet	$3900 \pm 800$	$1260 \pm 310$	$230 \pm 110$	$8.6 \pm 2.4$	$0.9 \pm 0.6$	$0.004 \pm 0.006$
Total	$131000 \pm 8000$	$18000 \pm 1100$	$1780 \pm 160$	$84 \pm 6$	$11.6 \pm 1.3$	$0.017 \pm 0.009$
Data	133131	18570	1827	98	10	0

The important information is just this

Use a table to show what's not obvious from a figure  
 Keep them simple (this one is borderline too complicated)  
 Label and provide a caption (neither of which appear here!)

# Use equations sparingly

Use equations only if **absolutely** necessary

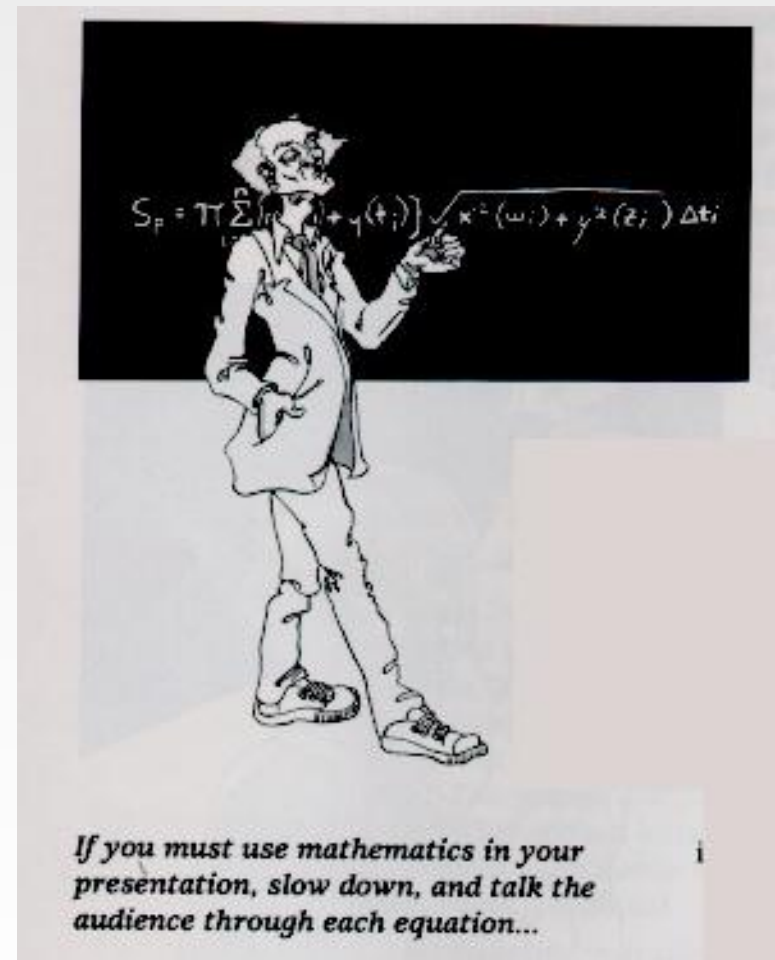
If you use equations

Slow down

Talk through step by step

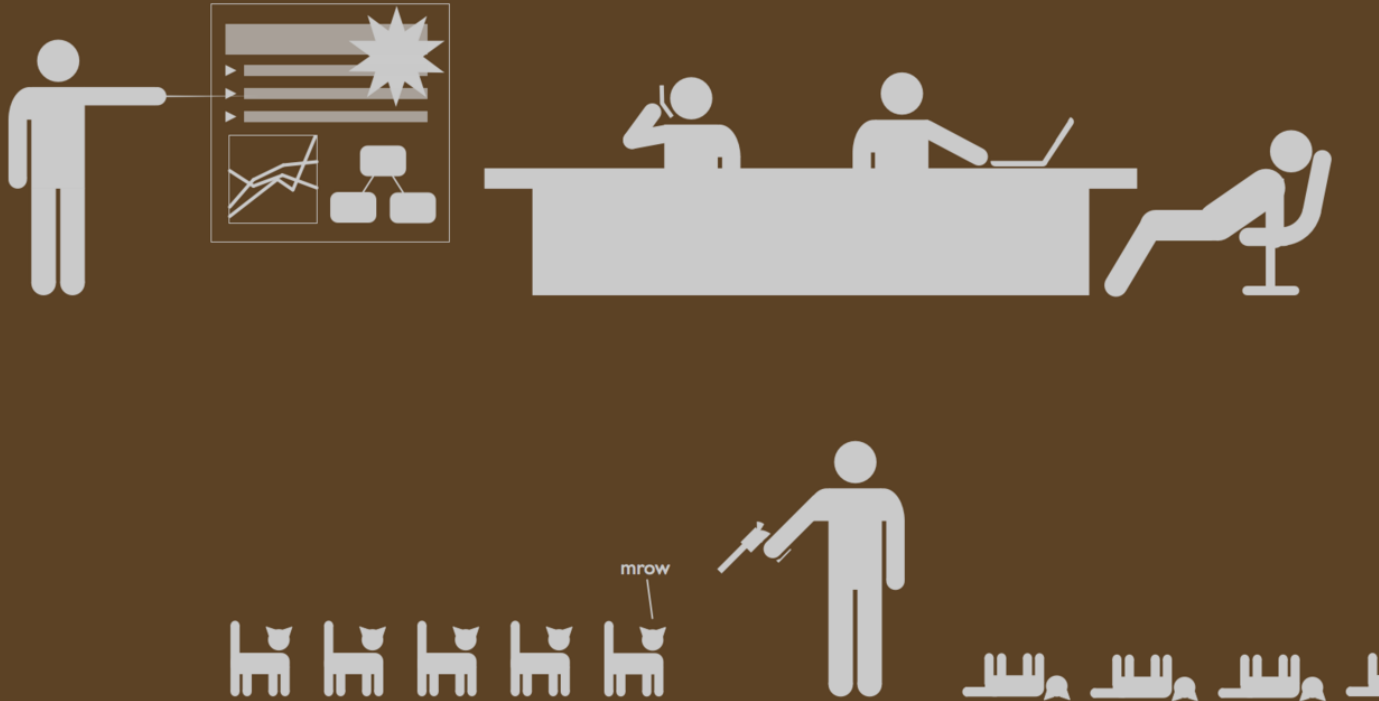
Explain relevance

Combine with a picture that illustrates the physical principle involved



# Use powerpoint with care

every time you make a powerpoint



mark goetz

<http://markandrewgoetz.com/blog/wp-content/uploads/2009/11/tufte-wallpaper.png>

# Stay away from funky fonts

## Short Sharp Science

Cutting-edge science, cut up

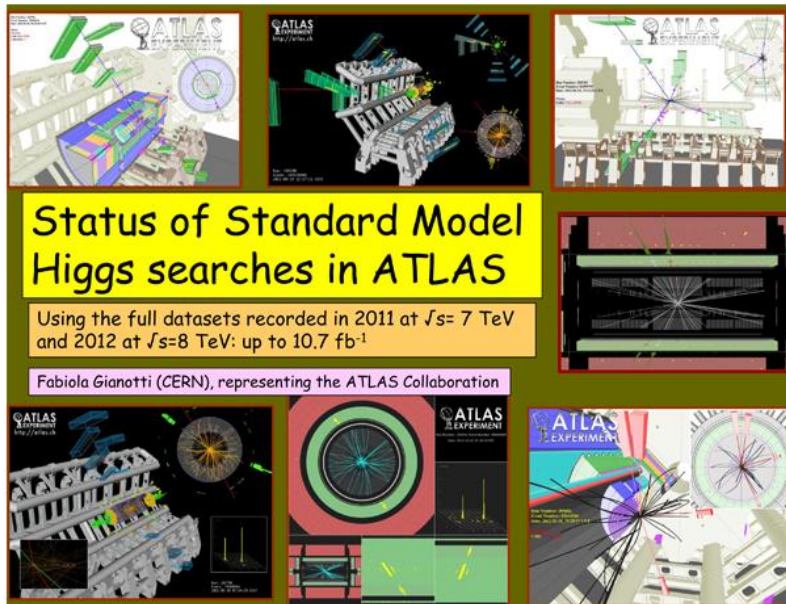


### Higgs in Comic Sans: the right font for physics?

17:18 6 July 2012

Physics & Math

Jacob Aron, reporter



(Image: CERN)

The Higgs results presented at CERN this week were met with applause and cheers from Geneva to Melbourne, but one group was less pleased: font devotees. That's because the slides of one of the two presenters, Fabiola Gianotti of the ATLAS experiment, bore text set in Comic Sans. The typeface mimics handwriting and is much maligned for its irreverence and overuse.

theguardian

News | US | World | Sports | Comment | Culture | Business | Environment | Science | Tr

Culture > Art and design > Comic sans

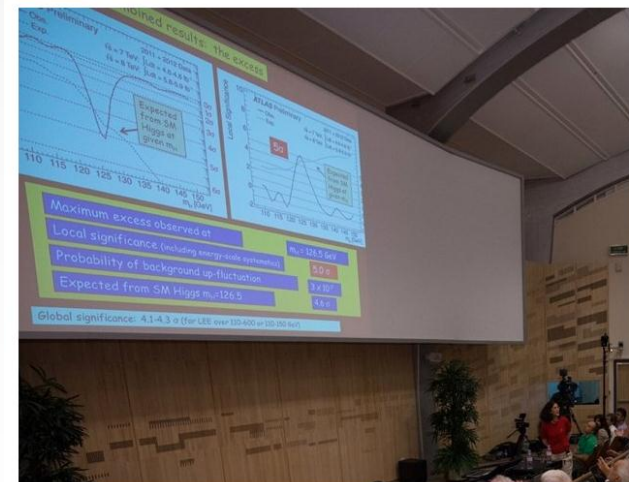
### Higgs boson and Comic Sans: the perfect fusion

There is outrage on Twitter over Cern's use of Comic Sans on presentation slides. But if ever there was an announcement that needed to be made in an easy-to-read font, it's this one

Share 680  
Tweet 345  
+1 34  
Share 10  
Email

### CERN scientists inexplicably present Higgs boson findings in Comic Sans

By Sam Byford on July 4, 2012 04:56 am Email @s3trangle



9.5k  
Like

5,517

For many of us, the most shocking revelation to come out of CERN's Higgs boson announcement today was quite unrelated to the science itself. Rather, we were blown away by the fact that a team made up of some of the most undoubtedly brilliant people in the world believe that Comic Sans is an appropriate font for such a historic occasion. While criticizing the much-maligned typeface is almost as much of a cliché as using it by

PART OF THIS STORYSTREAM 1

15 UPDATES TO The Higgs boson: CERN to discover the elusive

# Practice your talk

- Practice your talk so you know how long it is
- Think about how to segue from one slide to the next & remember where your story is going!
- Practice enough that your delivery is smooth, but not so much that it sounds scripted.
- Make sure you can fit in the allotted time! If not, rework it.
  - A little under the allotted time is OK. Way under is not.

# Deliver your talk

- Confidence
- Posture
- Eye contact
- Answer questions respectfully and if you don't know the answer, say so.
- Have fun!
  - If you don't have fun, it's unlikely the audience will

# Don't forget the conclusions slide

- Know your audience and your goal
- Organize your talk around 2-3 key points
- Use figures and tables carefully to convey key information
- Practice enough, but not too much
- Connect with your audience and have fun delivering your talk