We will present some of my slides and many Phys 403 student slides as examples. We can talk about why they are well constructed examples.

(All remarks about real slides are in these red boxes)

An eye-catching feature on slide 1
This is a technical presentation, so you must develop it as a logical sequence.

- **What was the goal?**
  - What physics did you address?
  - What technology?
  - Define your special vocabulary here

- **What did you actually do?**
  - Apparatus / Procedures / Raw Data

- **What are your results?**
  - Polished graphs, proofs, numerical findings
  - Principal difficulties and uncertainties

- **Conclusions**

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**Sentence title tells what the slide is about … the rest of the slide supports the assertion.**

**Fonts matter**
- Arial
- Comic Sans
- Times
- Courier

**In case of online it is not important - computer monitors have much better resolution that screen projectors.**
Font size and slide background choice

Optical Pumping - 32 bold (Title)

Tunneling 18-20 (Body text)

Courtesy to Wikipedia 14 (comments)
Font size and slide background choice

Optical Pumping - 32 bold (Title)

Tunneling  18-20 (Body text)

Courtesy to Wikipedia  14  (comments)

Make contrast between text and background
# Presentation components and grading scale.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Max. Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The whole day attendance</td>
<td>5</td>
</tr>
<tr>
<td>Title was sent to instructor on time</td>
<td>3</td>
</tr>
<tr>
<td>First slide has appropriate title, name, affiliation, date</td>
<td>3</td>
</tr>
<tr>
<td>Scientific background, goal and motivation were clearly and correctly presented</td>
<td>20</td>
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<tr>
<td>Research activities were clearly and correctly presented</td>
<td>20</td>
</tr>
<tr>
<td>Results were clearly and correctly presented</td>
<td>20</td>
</tr>
<tr>
<td>Technical aspects: good balance of text and figures, good quality figures, appropriate citations, correct spelling, correct number of significant digits, etc.</td>
<td>20</td>
</tr>
<tr>
<td>Time management: good balance between Introduction-Procedure-Results-Analysis</td>
<td>3</td>
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<tr>
<td>Spoke clearly, at a good pace, loud enough, etc.</td>
<td>3</td>
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<tr>
<td>Finished on time and answered questions clearly and correctly</td>
<td>3</td>
</tr>
<tr>
<td>Final Totals (100)</td>
<td>100</td>
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OPTICAL STUDY OF FERROELECTRIC POTASSIUM DIDEUTERIUM PHOSPHATE (DKDP)
Phase transition of Helium 4

Below $T_\lambda = 2.17$ K, helium exists in mixture of superfluid and normal liquid helium.
The experimental concept in one animation …

What happen if they are struck by pulses?

A pulse or a series of pulses is used to change the net magnetization of system. Pulsed NMR!

\[ M(t) = M_0 e^{-\frac{t}{T_2}} \]
What happens to a nucleus in a magnetic field?

\[ B = 0 \]

\[ B = B_0 \]

\[ \Delta E \]

\[ U = - \mu \cdot B \]

\[ M_z = -\frac{1}{2} \]

\[ M_z = \frac{1}{2} \]

\[ \Delta E = \gamma \cdot \hbar \cdot B_0 = \hbar \omega_0 \rightarrow \text{Larmor frequency!} \]

(Courtesy of Bishop, K)
Phase Transition in BaTiO$_3$
Phase Transition in BaTiO$_3$
Phase Transition in BaTiO$_3$
Phase Transition in BaTiO$_3$
Everybody loves an optical bench, but unless you map out the elements and the beam paths, it doesn't mean much.

Experimental Apparatus

- Beam Reducer
- Diffraction Grating
- Chopper
- PRQW
- Polarizer

[Image of experimental apparatus with labeled elements]
An example of image which is nice but does not help too much
The magnetic field from the Earth and other residual magnetic fields is minimized by rotating the stand and adjusting the vertical field coils to minimize the zero field peak width.

With the main field coils off, the sweep field is applied to determine the center of the zero field resonance (was found to be at 0.251A; using the geometry of the coils, this corresponds to 0.151 gauss).

RF field is adjusted to provide maximum transition probability.
Setup diagrams, apparatus, measuring idea...

Schematic diagram adapted from notes

- **SR830**
  - Lock-in amplifier
  - Ref In

- **Function generator**
  - Agilent 33220A

- **DMM**
  - HP34401A

- **GPIB**

- **cryostat**
  - Receiver
  - Resonator

- **LHe**

- **Asin(ωt)**

- **500 kΩ**
  - DC bias for receiver

- **3.2V**

- **6.4 μA**

- **10 μA**

- **10/6/2020**
Samples: preparation, configuration etc.
Setup of Source and Detectors

\[ \theta_{AC} \quad \theta_{AB} \quad \theta_{BC} \]

- Anode (to CFD)
- Dynode (to MCA)
- Aperture
- High voltage power supply

Physics 403 Summer 2020

10/6/2020
Results

Raw tunneling data

Energy gap derived from tunneling conductivity

Data + fitting results

Too small font!

Too many SD!

10/6/2020
Results

Difference in Up-Down (unnormalized)

Fit equation: \( \frac{-t}{\tau} Ne^\tau (1 + \alpha \cos(\omega t + \delta)) \)

Courtesy Samuel Homiller and Pakpoom Buabthong Fall 2013
Difference in Up-Down \( \text{(normalized)} \)

Fit equation \( N e^{\frac{-t}{\tau}} \left( 1 + \alpha \cos(\omega t + \delta) \right) \)

Courtesy Samuel Homiller and Pakpoom Buabthong Fall 2013
Results – witnessing a mystery?
Presenting data is your most important and challenging task.
Fitting to the Curie-Weiss law

\[ \varepsilon' = \frac{C}{T - T_C} + \text{off} \]

\[ C = 3563.3 \pm 0.4 \text{K} \]

\[ T_C = 118.9825 \pm 0.0003 \text{ K} \]

Courtesy Zongyuan Wang and Arnulf Taylor Su 2017
AFM of Optical Data Storage Media

**CD**

**DVD**

**Blu-Ray**

<table>
<thead>
<tr>
<th></th>
<th>CD</th>
<th>DVD</th>
<th>Blu-Ray</th>
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<tr>
<td>Track width</td>
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<td>0.24</td>
<td>0.15</td>
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Units in μm

10/6/2020
Fitting the data

\[ V = C \sqrt{\left( \frac{T - T_{\text{offset}}}{T_\lambda} \right) \left( 1 - \left( \frac{T - T_{\text{offset}}}{T_\lambda} \right)^{5.6} \right) } \]

Offset, intrinsic to the experiment

\[ C \approx 26 \]
\[ T_\lambda \approx 2.17 \]

Fit to the exponents as well

Reference, where this equation came from?

Perform the 5 parameter fit-

The values that are obtained are not very close to the expected values

Also, the fit is not the best
Try to fit the data with this function

\[ V = \left( 1 - \frac{T - T_{\text{offset}}}{T_\lambda} \right)^\gamma \]

The data refuses to fit to this function

\[ \chi^2 / \text{ndf} = 361.7 / 14 \]

\[ C = 14.56 \pm 0.04278 \]

\[ \gamma = 0.1668 \pm 0.003116 \]

\[ T_{\text{off}} = -0.2356 \pm 0.005738 \]

\[ T_\lambda = 2.17 \pm 0.0 \]
Finish your talk with the data analysis and conclusions and a slide showing the main points you want us to remember

- Make sure you discuss the principal uncertainties.
  - For most of these experiments, it will be how accurately does your instrument measure something
  - A few experiments will also have statistical uncertainties ... more data leading to a better finding

- Include a representative (simplified) graphic
  - This slide will be up during question period so this graphic will get burned into people’s memory

- Because this is a lab, offer some advice for others who follow
Typical Problems

Nice Figure

Great Data but lines are too thick, and symbols are too small
Typical Problems

Too many lines – graph should be “polished” (Optical Pumping)
Typical Problems

Al-Al₂O₃-Sn

$\frac{dI}{dV}$ (mS)
$U_{DC}$ (mV)

- $3.66$ K
- $3.43$ K
- $3.09$ K
- $2.85$ K
- $2.54$ K

Use more contrast color for lines
Deadlines

- All talk titles should be submitted not later than on midnight **Friday October 9**th

- Presentation files should be uploaded electronically not later than
  - **11:00 am October 13**th O1-1 - O1-12
  - and
  - **11:00 am October 15**th O1-13 - O1-23